

health of these people is stated to be directly dependent on the health of this wetland ecosystem.

Fish is an integral part of the diet of the people of Assam as it gets a lot of rainfall. Fish is abundantly available in all the districts of Assam, as it is a land of rivers, bills, swamps, ponds etc. The local "Rohu" variety is in much higher demand than the other imported fish. The most popular among the large variety of fishes are Rahu, Bahu, Mirika, Pithila, Kurhi, Bhangon, Barali etc. The smaller variety of fishes Kaoi, Magur, Singee, Pabha, Eleng, Bariala are common. The development of fisheries in the district is undertaken by the Government after independence. The Department of Fisheries has one natural seed collection centre at Kotoha near Dihing River. Every small and big river, large areas of water bodies, swamps and bils in the town are having a unique potential for development of inland fisheries. There are a number of unemployed youths but many of them are opting for fisheries as a livelihood option. There has also been a lot of development in aquaculture technologies.

The National Fisheries Development Board will set up its register centre in Amingaon Guwahati at an initial investment of Rs 50 crore on 30 bigha of Govt. land, which among other facilities will have a state-of-the-art Brood Bank that would be a game changer for the fishery sector in the entire northeast region.

3.3.3 Animal Husbandry and Dairy

Livestock plays an important role in state economy. Agriculture economy is supplemented by animal husbandry. Agriculture production depends very much on the livestock available. Cattle and goats are main animals. Buffaloes, Sheep, Horses, Pigs, Fowls and Ducks are the livestock and poultry found in the district.

People in the town are predominantly non - vegetarian and prefer both eggs and meat of birds of local variety. The climatic condition of the district is suitable for poultry farming. Most of the poultry birds are reared in small units. However, the farmers have to depend on other districts/states for supply of chicks.

The people in rural areas have long tradition of maintaining cows & buffaloes for supply of milk and milk products. The production of milk per local animal is 1.5 litre/day. The low productivity of the dairy animals is apparently due to poor genetic character of the local cows. Considering the demand & supply, there is ample scope for development

of this activity, particularly in rural areas adjacent to urban and semi-urban areas. Cattles, Buffaloes, Sheep, Goats, Pigs, Fowls and Ducks are the livestock and poultry. Presently, under West Assam Milk Producer's Co-operative Union Ltd. Purabi Dairy (located at Panjabari) is performing 72 TLPD Milk Supply per day in and neighbouring region of Guwahati which is probably planned to expand up to 150 TLPD capacity. Total 13,000 farmers are associated with this co-operative union and having more than 2000 outlets within Guwahati city.

3.3.4 Oil

Assam was central to India's bid to be self-sufficient in petroleum, particularly crude oil refining. Digboi refinery in Eastern Assam, established in 1901, was the lone hope until Prime Minister Jawaharlal Nehru inaugurated Guwahati Refinery on 1st January 1962.

Noonmati is a locality located in Guwahati, Assam in North East India. It is the place where Indian Oil Company (now the Indian Oil Corporation) commissioned its first oil refinery as well as country's first Public Sector Refinery.

Built with Rumanian assistance, the initial crude processing capacity of refinery was originally designed to process 0.75 million metric tonnes per annum of crude supplied by Oil India Limited and Oil and Natural Gas Corporation Limited from their Upper Assam oilfields. The refinery underwent a massive upgrade in the 1980s to increase its capacity to 1 MMTPA.

Guwahati refinery produces almost everything from high-speed diesel and motor spirit to aviation turbine fuel. It entered the era of ecologically friendly fuel with the installation of the Indmax unit, the first indigenous technology developed by Indian oil.

Due to dwindling supply of indigenous Assam Crude, Guwahati Refinery started processing Low Sulfur Imported Crude along with Assam Crude. The supply of LS imported crude to Guwahati Refinery is from Barauni Refinery via railway wagons. The Refinery supplies various petroleum products to North-eastern India as well as beyond, upto Siliguri end through the Guwahati-Siliguri Pipeline, spanning 435 KM, which was the first Pipeline of Indian Oil and commissioned in 1964. Most of the products of Guwahati Refinery are evacuated through pipeline and some quantity also through road transportation.

3.4 Secondary Sector

3.4.1 Household Industries

Weaving is one of the most important traditional occupations of the women in Kamrup district of Assam. Their artistic products have good demand in the market, and they are cherished by the tourists from other parts of the country as well as those from abroad. However, the productions on traditional looms are low besides time consuming.

Sualkuchi is situated on the north bank of the river Brahmaputra, about 35 km from Guwahati. Sualkuchi is a block of Kamrup District. It has large number of cottage industry engaged in handloom, for which it is also known as



the "Manchester of Assam". This is the textile centre of Assam. Muga silk and Pat silk along with Eri silk and Endi cloth from this region is famous for its quality. Mekhela chadors and Gamosas made from this indigenous material is in demand throughout Assam as well as other parts of India. As of 2011 India Census, Sualkuchi had a population of 14,877. Males constitute 50% of the population and females 50%. Sualkuchi has an average literacy rate of 82%, higher than the national average of 59.5%: male literacy is 88%, and female literacy is 76%.

Table 3-5: Household Industries in GMPA

Sr. No.	Handicraft Items	Name Of the Place	District/City
1	Silk, Muga and Evdi fabric	Ambari Bamuni Maidan RGB Road Chandmari	Guwahati Guwahati Guwahati Guwahati
2	Dry flower	Dispur	Guwahati
3	Orchids and cut flower	Noonmati	Guwahati
4	Jute yarn	Ambari	Guwahati
5	Cane and bamboo furniture	Bamuni Maidan Kaithal Kuchi Gopinath Nagar North Bongaon	Guwahati Nalbari Guwahati Kamrup
6	Bell metal wares	Sarthebari Titabor	Kamrup
7	Brass metal	Hajo	Kamrup

(Source: 20- year perspective tourism plan for the state of Assam Report)

3.4.2 Construction

The urban area of Guwahati has majorly Concrete construction. The villages around Guwahati are mostly houses for which bamboo reinforced biomass was traditionally used as cladding material while thatch or corrugated iron sheets were used as roofing materials. Most houses in these villages around the city of Guwahati are of the traditional Assam-housing typology where the roofing system consists of timber/bamboo trusses supporting thatch or CGI sheets. A gradual shift towards confined masonry houses can be observed. In present day however houses on modern line using CI sheets, brick and cement are common in both rural and urban areas.

3.4.3 Manufacturing

Guwahati is considered as an industrial hub of Northeast region of India. Mostly, all the industries are situated outskirts of city. North Guwahati occupies most of the industrial parts such as Godrej, Steels, Cement etc. Guwahati is at the centre of economic activities dominated by the following industries:

- Oil and natural gas
- Tea production
- Tourism
- Power generation
- Fertilizer
- Cottage industry
- Cane and Bricks

3.4.3.1 Large Scale Industries

Table 3-6 Large Scale Industrial Units and Employment (State & District)

Sr. no.	Large scale industries	Units			
		Assam		Kamrup Dist. (Rural & Metro)	
		Work area	Workers	Work area	workers
1	Printing, Publishing and reproduction of recorded media	43	1048	28	817
2	Manufacturing of Coke, refined Petroleum products and natural fuel	68	5877	50	3625
	Manufacturing of chemicals and chemicals products	152	7751	107	4863
3	Manufacturing of Rubber, Plastic products.	177	3643	116	1920
4	Manufacturing of Non-Metallic mineral products	8416	36101	199	6703
5	Manufacturing of basic metals	172	4070	88	2600
6	Manufacturing of fabricated Metal products and part (except Machinery and equipment)	109	1420	40	535

7	Manufacturing of Machinery and equipments N.E.C.	50	966	13	137
8	Manufacturing of office accounting and computing machinery	1	0	1	0
9	Manufacturing of Electrical Machinery and apparatus N.E.C.	61	1274	41	749
10	Manufacturing of radio, television and communication equipments and apparatus.	6	143	6	143
11	Manufacturing of Medical, precision and optical instruments, watches and clocks	5	84	5	84
12	Manufacturing of Motor vehicles, Trailors and Semi-Trailors etc	2	32	1	17
13	Manufacturing of other Transport Equipments	12	3817	8	386
14	Manufacturing of Furniture, Manufacturing of N.E.C.	26	611	20	393
15	Electricity, Gas, Steam and Hot Water supply	43	1406	11	361
16	Sale, Maintenance and repair of motor vehicles and motorcycles; retail sales of automotive fuel	113	2307	34	654
17	Wholesale Trade and Commission Trade, except of Motor vehicles and motor cycles	1	0	1	0
18	Retail Trade, except of motor vehicles and motorcycle repair of personal and household goods	19	107	3	16
19	Land Transport, transport of via pipelines	3	98	1	19
20	Supporting and auxiliary transport activities, activities of travel agencies (including Storage and Warehousing)	31	475	7	123

(Source: Statistical Handbook of Assam, 2012, Census 2011)

3.4.3.2 Medium Scale Industries

Several industries engaged in manufacture of machinery, machine tools and parts, steel furniture, steel structure and other material products are established. The district has also many sawmills and bricks making industries, besides other various small-scale industries. There is good scope for further development but there are identified weaknesses that include - poor supply of electricity & high rate of electricity charges, insufficient supply of skilled labourers, transportation of goods, financial institutions lend money at higher rate and no marketing linkage with Public Sector Enterprises.

Table 3-7 Medium scale industries

Sr. no.	Manufacturing industries	Units			
		Assam		Kamrup Dist. (Rural & Metro)	
		Work area	workers	Work area	workers
1	Manufacturing off food products and beverages	1559	7123	169	5473
2	Manufacturing of tobacco products	53	760	34	426
3	Manufacturing of Textiles	60	4394	32	2147
4	Manufacturing of wearing apparel, dressing and dyeing of Fur	3	120	3	120
5	Manufacturing of wood and products of wood and cork, except furniture, articles of straw and plaiting materials	420	8175	117	1594
6	Manufacturing of Paper and Paper products	68	4111	44	869

Table 3-8: Industrial Units and their Details

Sl. No.	Industrial Unit	Details
1.	Premier Cryogenics LTD.	Premier Cryogenics LTD is leading Industrial gas Manufacturing company of India. Guwahati has been in operation since 1996.
2.	APEX Yarn Pvt LTD	Apex Yarn Private Limited is a Private incorporated on 7 th August 1997. It is classified as non-Govt Company.
3.	Godrej Consumer Product	Private sector Organisation that offers services in Consumer Goods
4.	Supreme Industries	The Supreme Industries has made a name for itself for furniture fitting and fixture
5.	Shree Mahavir Industries	The Company trade reports mainly contains Market analysis, Contact, Trade Partner, Port statistics and Trade area analysis

3.5 Tertiary Sector

3.5.1 Trade

Guwahati is an important river port and Assam's principal commercial centre. The city offers all modern facilities. It has ample eateries including many national and international food chains, entertainment zones, amusement parks, multiplexes and shopping malls with the best of retailing names. It is the hub of commercial and trading activities in the region. It is bustling with all major national and international companies, banks, hotels, hospitals. Besides commercial activities, the city hosts a variety of cultural activities at regular intervals. There are mostly commercial establishments in and around Guwahati and its shows most of the population are engaged in trade,

commerce and office work. Most of the trading activities related to packing, manufacturing, construction, distributing etc., of goods within the country and abroad are done here. Timber products are also important which plays a significant role in economy.

3.5.1.1 *Street Vending*

Street markets have been an important part of Guwahati's trade and commerce since a century. Today, nearly 30,000 street vendors sell their wares across the city according to the NGOs STEP. The Guwahati Municipal Corporation Act, 1971 defines market as "any place where persons assemble for the sale and purchase of articles intended for food or drink or livestock or other merchandise."

According to the Market Branch of the GMC, there are three kinds of markets in Guwahati. First are the rented markets where GMC has built shops and allotted them to shopkeepers from whom it collects rent. In Guwahati, there are 13 rented markets (Table 3-9). The second type are the lease markets. There are 7 lease markets in the city (Table 3-9). The third type of markets are the informal markets which accommodate all other vendors who cannot afford the high rents at GMC rental markets or do not get space at lease markets. Furthermore, informal markets are natural phenomena, which emerge with public demand for certain goods in certain areas. It would therefore seem that the 12 rental markets and 7 lease markets do not adequately fulfil the public demands, which is why these informal markets have come up in various parts of the city. There is no official data regarding the number and location of informal markets in the city. Examples are the Ulubari market and the market opposite Guwahati Medical College. Informal vendors, singly or in small groups of 2-3 vendors, can also be found on various street corners in different localities of the city. Furthermore, in both the lease markets and the informal markets, tribal women from nearby villages come to vend— they are the "regular irregulars" since they do not come on daily basis to sell their wares in the markets. There is also one cooperative market in the city. This is the Pioneer Cooperative market in the Athgaon area which is run by the market's cooperative society.

Table 3-9: Market areas located in GMPA

Type of Market	Name of market
Rented Market	1. Fancy Bazaar GMC market
	2. T.R.P. Road GMC
	3. Paltan Bazaar GMC Market
	4. Uzan Bazaar market
	5. Fatasil Market
	6. Machkhowa
	7. New market
	8. Chandmari Flyover market
	9. Chandmari Colony market
	10. Ganeshguri market
	11. Ulubari market
	12. Dispur Supermarket
	13. Wholesale Fish Market
Lease Market	1. Uzan Bazar lease market
	2. Beltola weekly bazaar
	3. Beltola evening daily market
	4. Kacharighat market
	5. Fatasil Market
	6. Dispur Supermarket
	7. Goat market at Santipur

The informal vendors regularly face difficulties from the regulatory urban local bodies due to issues of encroachment up on footpaths and parking chaos happens due to vending on sides of carriageways. Mainly the pavement and roadside vendors, which primarily face difficulties because of occupancy or spill over onto pavements and roads leading to overcrowding and congestion in the areas. This problem becomes more acute in busy commercial areas, particularly where there are narrow lanes and by-lanes. Eviction of roadside vendors to clear them off the government and municipal land and from main roads is conducted from time to time. Such operations often temporarily clear the area, but many vendors come back to the same location after a few days. Informal street vendors were displaced from near the Ganeshguri bridge for “security reasons” after the bomb explosions in 2008. Informal street vendors have

also been displaced under urban development projects such as flyover and road construction (The Assam Tribune 2010).

To protect the rights of urban street vendors and to regulate street vending activities and for matters connected therewith or incidental thereto, Govt. enacted an Act called The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014. Under this Act Guwahati Municipal Corporation in association with National Urban Livelihood Mission has notified Vending Zones and No Vending Zones within the City as mentioned below.

Vending Zone

Table 3-10 Vending Zone in City

Sr. No.	Location of Vending Zone	Area	Holding Capacity
1	Ganeshguri, wholesale gali	L: 644 ft/ B: 3 ft	100Nos
2	Barbari, VIP Road, near IIHM	L: 250 ft/ B: 7 ft	42 Nos
3	Panbazar, opposite to Meghdoot Bhawan	L: 375 ft/ B: 9 ft	52 Nos
4	Uzan Bazar, in front of GMC office (restricted vending zone, from 5 pm to 9 pm)	L: 90 ft/ B: 14 ft	20 Nos
5	Fancy bazar, Phool Gali	L: 210 ft/ B: 5 ft	30 Nos
6	AT Road, Col. J. Ali Road	L: 110 ft/ B: 5 ft	15 Nos
7	Chandmari, under flyover, south side	L: 146 ft/ B: 48 ft	110 Nos
8	Mezzanine Floor of mutistoried building of GMC at Fancy Bazar	Entire mezzanine floor	230 Nos
Total no of street vendors to be relocated			599 Nos

(Source: NULM, GMC, Guwahati, 2020)

No Vending Zone

SS Road stretching from Goenka Point near Sikh Temple to M.G. Road near LIC Office has been declared as No Vending zone by the TVC, Guwahati City.

3.5.2 Tourism, Hotels and Restaurants

The gateway to the seven other north-eastern states, Guwahati is a vital tourist link point, besides being an attraction. Guwahati situated on the banks of the mighty Brahmaputra, at an altitude of 55 meters above sea level. It is particularly famous for its Kamakhya temple situated atop the Nilachal hill, at 10 km from the railway station. There are many religious sites, state zoo, and various museums-the State Museum,

Anthropological Museum, Forest Museum, and Cottage Industries Museum-are treasure houses of Assam's rich cultural past. The Guwahati planetarium, located on MG Road, is one of the finest in the country.

With several tourist attractions, religious as well as spiritual in Guwahati, one has the chance to enhance his cultural knowledge and experience its beautiful heritage and landscapes. Amongst the many top things to do in Guwahati, tourists find visiting the tea gardens to be the most appealing. Given below is the worth watching sites in/around the city:

Table 3-11 Tourism Destinations at Guwahati

Within Guwahati		Category
1	Kamakhya & Bhubaneswari Temple	Spiritual Tourism
2	Basistha Asharam	Spiritual Tourism
3	Navagraha Temple	Spiritual Tourism
4	Sukreswar Temple	Spiritual Tourism
5	State Zoo cum Botanical Garden	Wildlife Tourism
6	State Museum	Wildlife Tourism
7	Planetarium	Leisure Tourism
8	Nehru Park	Leisure Tourism
9	Gandhi Mandap	Leisure Tourism
10	Srimanta Sankardev Kalakheta	Leisure Tourism
11	Science Museum	Leisure Tourism
12	Balaji Mandir	Spiritual Tourism
13	Shyam Mandir	Spiritual Tourism
14	Ugratara Mandir	Spiritual Tourism
15	16th Jyotilinga Mandir in Pamohi	Spiritual Tourism
16	Deepor Beel	Eco Tourism
17	Umanada Temple	Spiritual Tourism
North Guwahati		
18	Dirgheswari Temple	Spiritual Tourism
19	Aswaklanta Temple	Spiritual Tourism
20	Moni Koneswar Temple	Spiritual Tourism
21	Dol Gobinda Temple	Spiritual Tourism

22	Rudreswar Dewalaya	Spiritual Tourism
23	Auni Ati Satra	Spiritual Tourism
24	Kanai Boroshi	Spiritual Tourism

In Guwahati there are lot of Hotels and Restaurants from 5 star to 2 star and from costly to low priced. Radisson Blu, Hotel Taj are renowned hotels and many more are there. Now a days many hotels and restaurants are being set up and it's increasing day by day. From fooding to lodging best hotels and restaurants can be found in Guwahati. There are more than 650 Hotel near and in the City of Guwahati. There are few listed out on their Popularity. There are more than 700 restaurants in and around the City of Guwahati. There are few listed out on their Popularity

Table 3-12:Hotels in GMPA

SI No	Hotel	Location
1.	The Hotel Palacio	Jaya Nagar, Khanapara
2.	The Lily Hotel	Six Mile
3.	Taj Vivanta	Khanapara
4.	Radisson Blue Hotel	National Highway 37, Gotanagar
5.	Hotel Shoolin Grand	Rukmini Gaon
6.	Hotel Lilawati Grand	Pan Bazar
7.	Greenwood Resort	Khanapara
8.	Landmark Hotel	Dr. B Booruah Road, Ulubari
9.	Hotel City palace	Paltan Bazar
10.	Hotel Riviera	Hatigaon
11.	Novotel	Downtown
12.	Hotel Royale De Casa	Beltola Tiniali
13.	Treebo Trend Parnil	Azara Poice Station
14.	MayFLower hotel	Pan Bazar
15.	Hotel Dynasty	Lakhtokia
16.	Hotel Nakshatra	Beltola Tiniali
17.	Ginger Hotel	Hengarabari
18.	Blue Moon Hotel	Uzan Bazar
19.	Hotel Atithi	Nepali Mandir, Paltan Bazar
20.	Hotel Rajmahal	Assam Trunk Road

(Source: Domestic Tourism, Assam, Ministry of Tourism)

Table 3-13: List of Hotels by Rating in Guwahati approved by Ministry of Tourism, Govt of India

SI No	Hotel Name	Category	No. of Room
1.	The Lily Hotel	3	78
2.	Aarian woods	3	15
3.	Hotel Barak Residency	2	36
4.	Hotel Sunview	2	31
5.	Hotel Grand Majesty	2	32
6.	Hotel Bhargav Grand	3	45
7.	Hotel Royal Highness	3	27
8.	Cygnett Inn Repose	3	41
9.	Hotel S.J. International	3	37
10.	Kiranshree Grand	5	120
11.	Hotel Vivanta by Taj	5	150
12.	Hotel Radisson Blue	4	196
13.	Hotel Vishwaratna	3	59
14.	Kiranshree Portico	3	60
15.	Hotel Atithi	3	64
16.	Hotel Gateway Grandeur	3	26
17.	D Coutyard	2	32
18.	Hotel Novotel	5	118
19.	Hotel Rains In	3	21
20.	Hotel Lilabati Grand	3	30
21.	Hotel Dichang	3	75

(Source: Domestic Tourism, Assam, Ministry of Tourism)

Table 3-14 Restaurants in GMPA

SI No	Restaurant	Location
1.	Khorika	Goswami Service
2.	Paradise Resturant	Silpukhuri
3.	Beatrix	Uzanbazar
4.	Spice Route Resturant	Dispur
5.	Gopal Maharaj Resturant	Fancy Bazar
6.	Kiranshree	Ganeshguri
7.	Food Villa	Panbazar
8.	Fat Belly	Uzan Bazar
9.	Conficus Chinese Resturant	Christian Basti
10.	Terra Maaya	Tarun Nagar
11.	Royal Naga Resturant	Paltan Bazar
12.	MAA Manasha	Pandu
13.	Chennai Kitchen	Christian Basti
14.	Mising Kitchen	Hengarabari
15.	Woodlands India	Ulubari
16.	Chung Fa Resturant	Zoo Narengi Road
17.	Absolute Barbeques	GS Road, ABC
18.	Majulir Asanj	Chandmari
19.	Red Hot Chilli Pepper	Ganeshguri
20.	Seven	Khanapara

3.5.3 Transport, Storage and Communication

Guwahati is Assam's largest city that is also known to be northeast India's largest urban area. The city is one among fastest growing cities in the country. This beautiful place is located at Brahmaputra's south bank and is also named as the city of the temples. The state transport buses, and private buses ply regularly in the roads of the districts carrying passengers and goods to and from all places in around Guwahati. It also possesses a developed waterway transportation system along and across the Brahmaputra.

Being the gateway to Northeast, Guwahati well connected with the other states and parts of the state by road, rail, air and waterway. The State Transport buses as well as private buses ply regularly in the roads of the district carrying passengers to and from all important places with state and district headquarters. It also possesses a developed waterway transportation system along and across the Brahmaputra River, known as the National Waterway 2 which runs internally in the state.

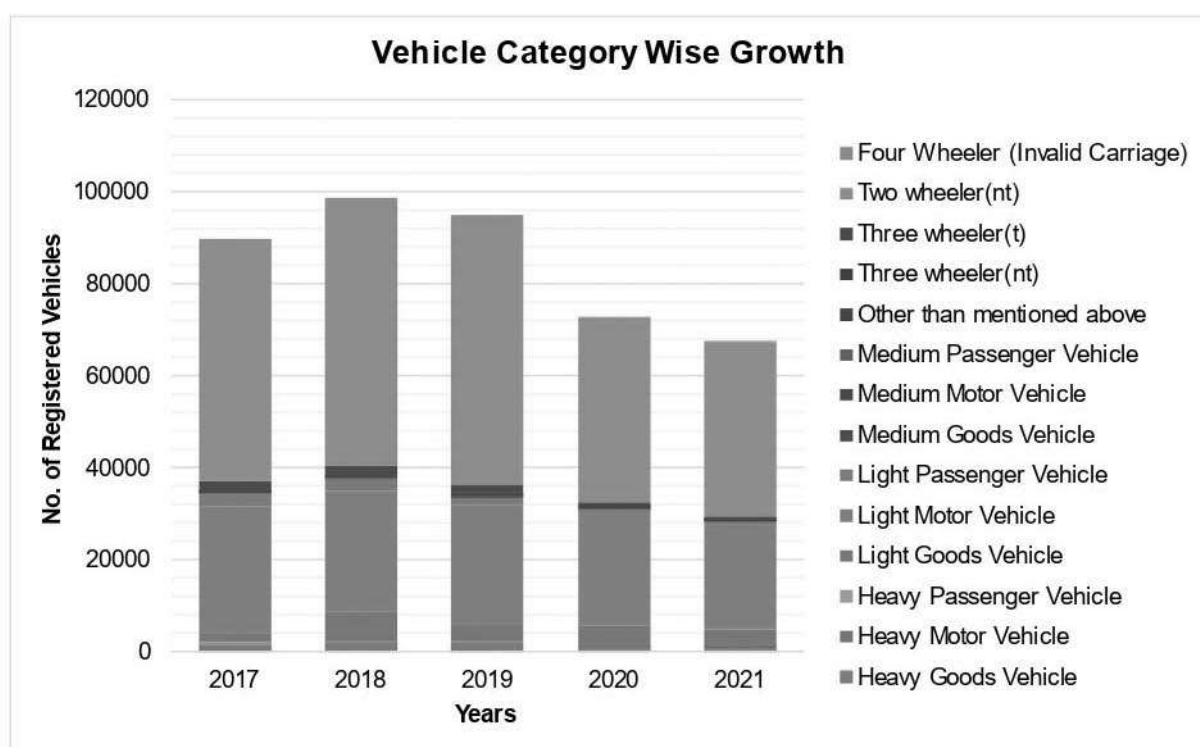


Figure 3-4 Vehicle yearly growth as per category for year 2017-21

(Source: DTO, Guwahati)

Food Corporation of India (FCI) godowns are located just near to the New railway station at Noonmati and being utilised for Govt. grocery storage for public distribution. One DBRG railway goods yard is located in New Railway station premises for the daily import and export supply in Domestic freight. Guwahati LGBI Airport consist its own warehouse for storage of goods and daily courier services. Many other privately hold

industrial and cargo-based warehouses are observed road side to NH 37. Multiple locations found by courier services across the city.

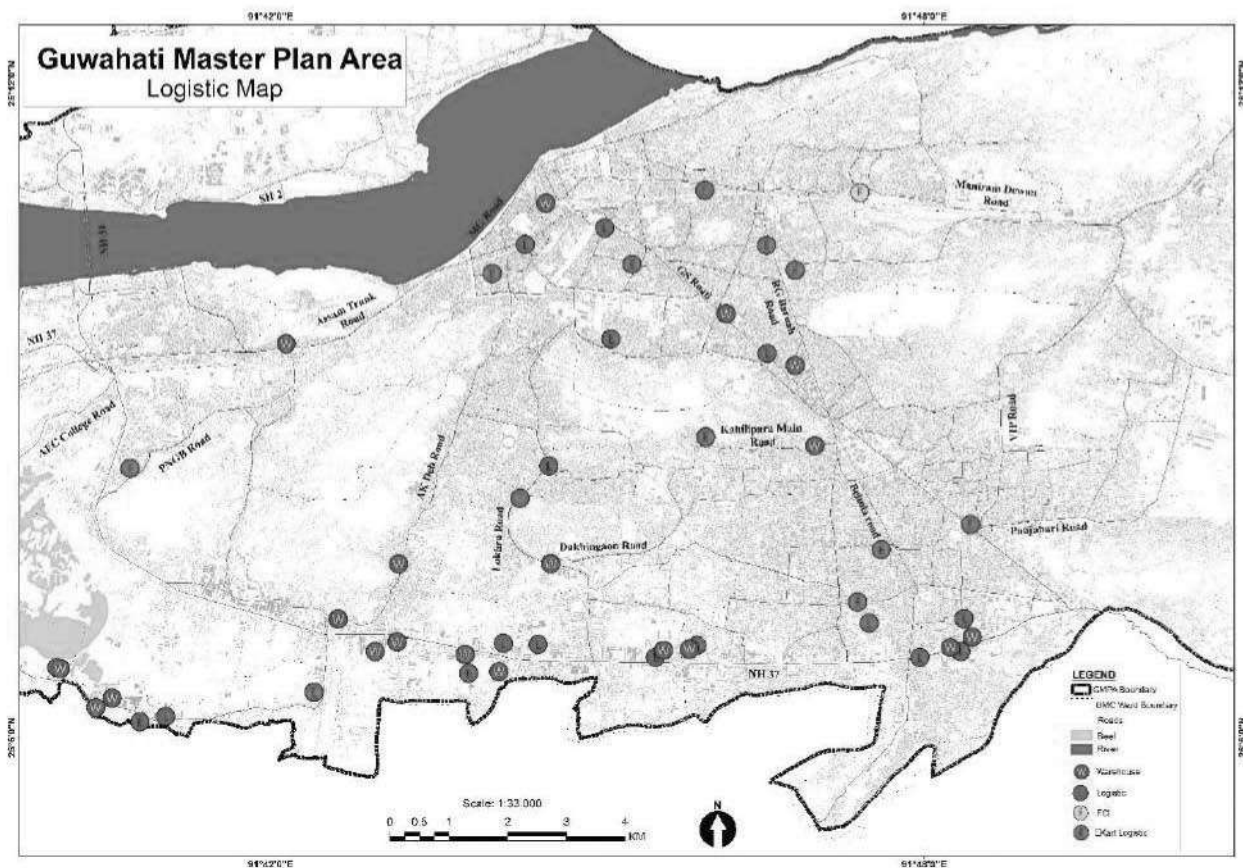


Figure 3-5: Storage and warehouses across Guwahati

The Guwahati Radio Station of state-owned All India Radio was inaugurated on 1 July 1948 as Shillong-Guwahati Station. The Headquarter of the Shillong-Guwahati Station was shifted from Shillong to Guwahati in 1953. It is a full-fledged regional broadcasting station with 3 channels; the Guwahati A & B Channels are AM Channels, and the CBS Channel is a FM

Channel. The other FM stations include 92.7 BIG FM, Radio Gup-Shup 94.3 FM, Red FM 93.5 and Radio Mirchi. Telecom services are BSNL, Airtel, Vodafone, Idea Cellular and Jio.

Doordarshan Kendra Guwahati provides composite satellite television services to Northeast India. The Guwahati-based 24-hour regional news channels include News Live, DY 365, Pratidin Time, Prag News, Assam Talks and News 18 Assam/North-East.

The daily Assamese newspapers which are published from the city are Dainik Agradoot, Asomiya Pratidin, Asomiya Khobor, Amar Asom, Dainik Janambhumi, Janasadharan, Niyomiya Barta, Dainik Asam, Dainandin Barta and Gana Adhikar. English dailies are The Assam Tribune, The Sentinel, The Telegraph, The Times of India, and Eastern Chronicle. Eclectic Northeast Magazine is a leading Guwahati-based monthly Northeast magazine with an online version. G Plus is the only English weekly tabloid published from Guwahati.

3.5.4 Banking

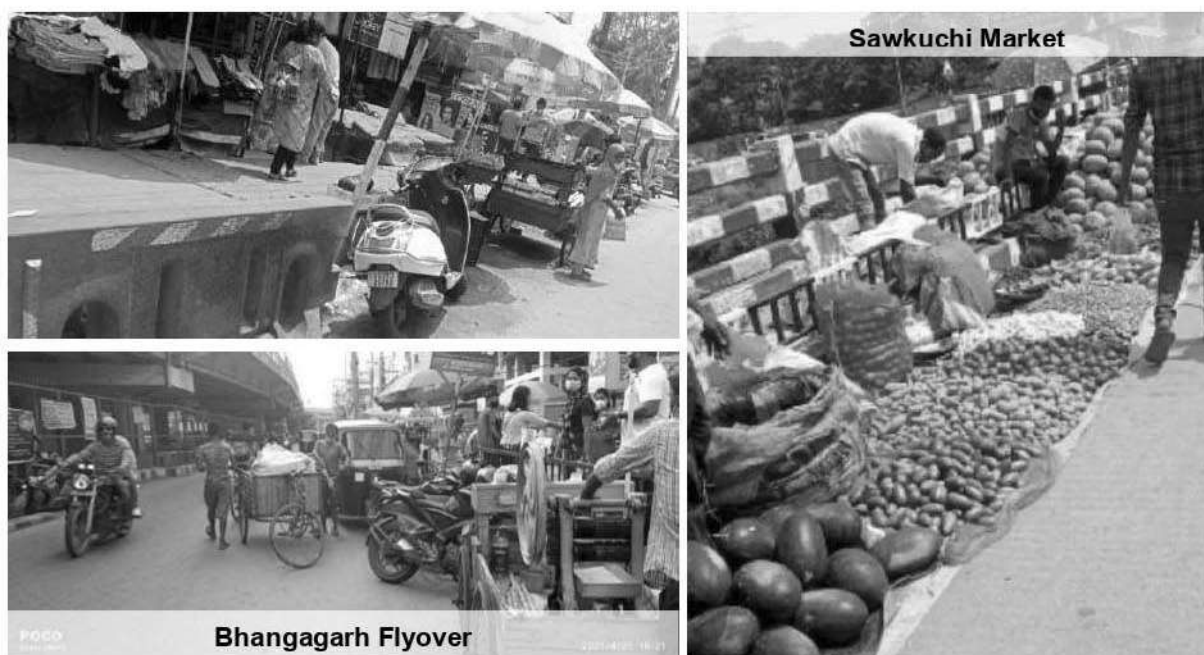
With the expansion of the industries and oil industry, several banks have been set up in various parts of the city. In addition, co-operative credit societies are also in operation but there are no Non-agricultural Credit Societies. However, even now also, the moneylender continues to be an important source of rural credit.

3.6 Informal Sector

The informal sector, also known as the underground economy, black economy, shadow economy, or gray economy, is part of a country's economy that is not recognized as normal income sources. People who work in the informal sector do not declare their income and pay no taxes on them.

Mainly the roads, footpaths are encroached by the vendors in the town. But there are markets and small bazaar which includes Fancy Bazar, Beltola Market, Colony Bazar, Kachari Basti Bazar, Uzan Bazar market, Ganeshguri market, Amom Gaon Wholesale Market etc. These markets are on daily and weekly basis. It includes food stalls, grocery, green grocers, meat vendors, cheap cosmetics stalls, etc.





3.7 Employment

3.7.1 Occupation Pattern

Employment is one of the key indicators in determining the purchase power and social status of a community. According to census 2011, the majority of the working population (80%) is engaged in tertiary sector which include tourism, trade & commerce, transport, communication and services etc. This can be attributed to the reduction in agricultural land, higher income employment opportunities and urbanization of the planning area.

Table 3-15 Total Employment of Guwahati City

Year	Population	Main workers	WFPR	Primary	%	Secondary	%	Tertiary	%
2001	990161	319706	32.28	12177	3.8	10281	3.21	297248	92.9
2011	1141699	379560	39.24	13210	3.48	11506	3.03	354844	93.49

(Source: Census of India)

As per census 2011, the workers are classified into three categories Primary (agricultural cultivators, agricultural labourers), Secondary (household industrial workers) and Tertiary (other workers). In GMP area, the distribution of economic base into type of sector namely primary sector, secondary sector & tertiary sector are imperative to provide a guideline for the development of entire planning area and

creation of potential centers of development. It is evident from the Figure 3-6 that engagement in tertiary sector is higher since 2001, at the cost of primary sector in Municipal area. This can be attributed to the reduction in agricultural land, higher income employment opportunities and urbanization of the municipal planning area.

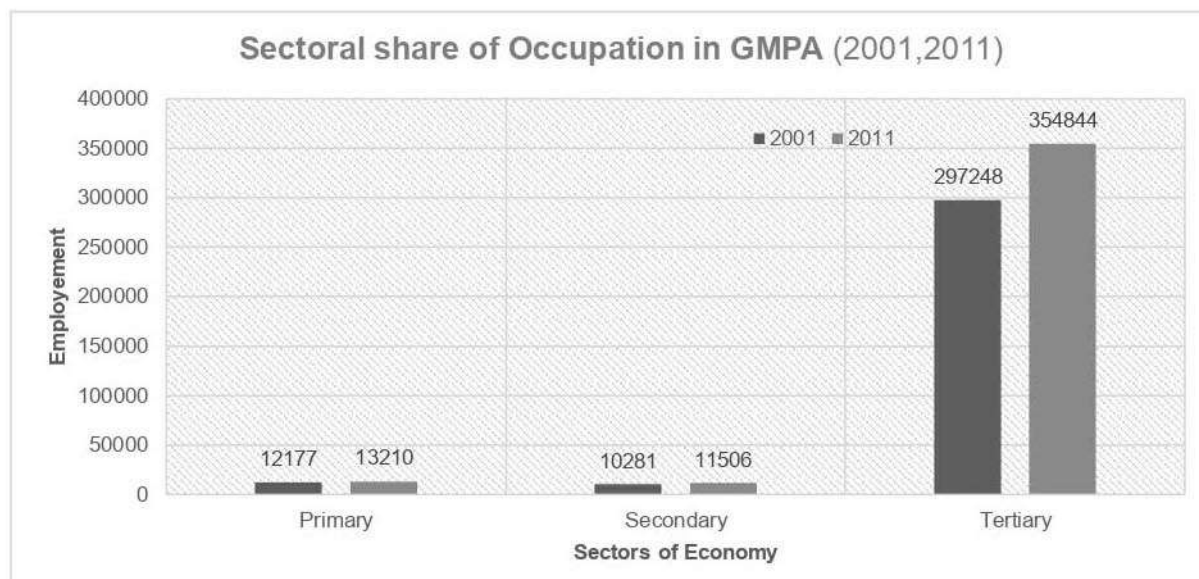


Figure 3-6 Sectoral share of Occupation in GMPA (2001,2011)

According to census 2011, the majority of the working population (93.4%) is engaged in tertiary sector which include tourism, trade & commerce, transport, communication, and services etc. Table 3-15 also reveals that an decreasing trend has been observed in the primary sector (3.8% to 3.4%) during the year 2001-2011 respectively in the system. Further it has been observed that there is increasing trend in the tertiary sector during the same period from (92.9% to 93.4%). It can be concluded from the above analysis that the tertiary sector is the major contribution in the economic growth and development of the Guwahati Municipal Planning Area.

The trend of the higher numbers in the employment in tertiary sector is indicative of the engagement of workers mainly in the service sector. There is need to balance this transformation into tertiary sector as well as primary sector for balanced economic development.

3.7.2 Employment by Formal-Informal Sectors

The economical employment has been divided in two parts Formal and Informal sectors. Presented here, is sectoral employment comparison with State and Guwahati Master Plan Area.

Table 3-16 Formal sector employment

Year	Formal sector employment (Assam)	Formal sector employment (Guwahati)
2001	1130951	33929
2002	1084135	32524
2003	1079212	32376
2004	1097233	32917
2005	1153079	33582
2006	1119400	33582
2007	1167500	35025
2008	1081869	33102
2009	1103398	33102
2010	1114100	33423
2011	1120600	33618

(Source: Directorate of Economics and Statistics)

Table 3-17 Informal Sector Employment of Guwahati 2001 – 2011

Year	Total employment	Formal sector employment	Informal sector employment	% of Informal sector to total employment
2001	279704	33929	245775	88
2002	282941	32524	250417	89
2003	286222	32376	253846	89
2004	289544	32917	256627	89
2005	292908	33582	259326	89
2006	296313	33582	262731	89
2007	299764	35025	264739	89
2008	303259	33102	270157	89
2009	306798	33102	273696	89
2010	310384	33423	276961	89
2011	305173	33618	271555	89

(Source: Directorate of Economics and Statistics.)

The above Table shows that informal sector plays a very important role in Guwahati. During the period 2001 -2011, the informal sector accounted for around 90% of city's total employment level. The employment trend also indicates the fact that the formal sector plays a very insignificant role in Guwahati's economy. This result is quite consistent with another study made during the period 1991-2001 where informal sector employment varied between 86 – 90% of total employment.

3.7.3 Workforce Participation in GIS based Master Plan area

The details of workforce participation of Guwahati Planning Area for year 2011 is presented in the Table 3-18.

Table 3-18 Work force participation rate of Guwahati Master Plan Area (2011)

Sr. No.	Name of Area	Population	1	2	(1+2)	Non-Worker	% of Worker in total population	% of Non-Worker in total population
			Main Worker	Marginal Worker	Total Worker			
1	GMC (60 Wards) + 1 OG	962334	327058	48984	376042	586292	39.08%	60.92%
2	8 CT (Census Towns)	59497	18582	4818	23400	36097	39.33%	60.67%
3	N. Guwahati (4 wards)	10,328	2748	1071	3819	6509	36.98%	63.02%
4	79 Rural Villages	109540	31172	12208	43380	66160	39.60%	60.40%
Total		1141699	379560	67081	446641	695058	39.12%	60.88%

(Source: Census of India, 2011)

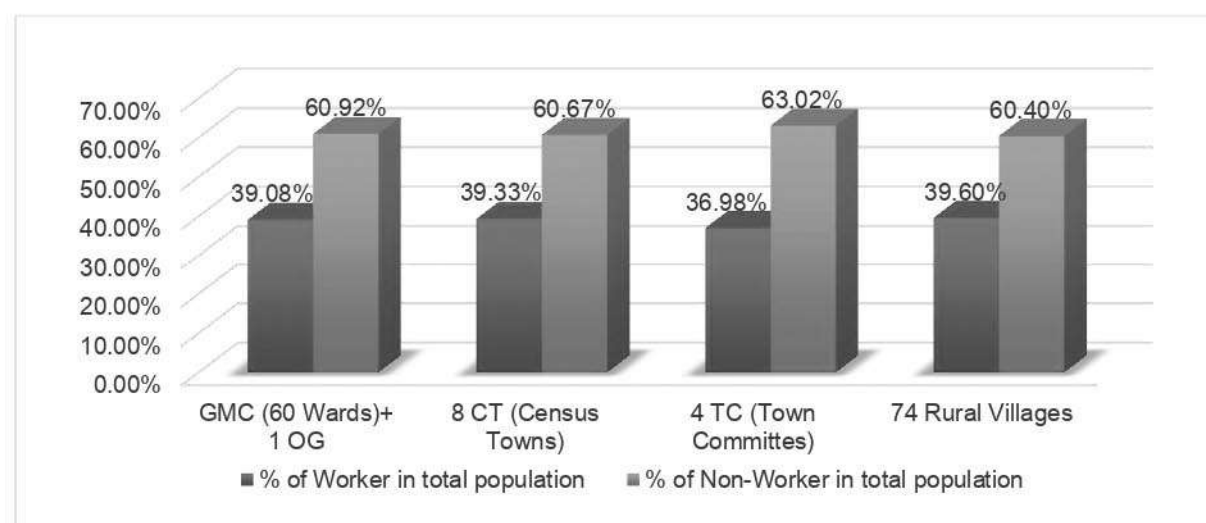


Figure 3-7 Work force participation rate of Guwahati Master Plan Area 2011

The Table 3-18 reveals that the workforce participation rate (WPR) for the planning area for year 2011 is 39.12%. Overall entire GMPA observes almost similar workforce participation rate due to the urbanization of the area and the metropolitan character of the city.

The table also reveals that the workforce participation rate is nearly similar in Guwahati Municipal Corporation, Semi-urban area and in North Guwahati town in last decade.

3.7.4 Workforce Distribution

Workforce population distribution according to sectors are as mentioned below

3.7.4.1 Workforce distribution by type of workers

Table 3-19 Workforce distribution in GMPA by type of work, 2011

Sr. No	Name of Area	Population on 2011	Main Worker	%	Marginal Worker	%	Non-Worker	%
1	GMC (60 Wards) + 1 OG	962334	327058	33.99	48984	5.09	586292	60.92
2	8 CT (Census Towns)	59497	18582	31.23	4818	8.10	36097	60.67
3	North Guwahati (4 wards)	10,328	2748	26.61	1071	10.37	6509	63.02
4	79 Rural Villages	109540	31172	28.46	12208	11.14	66160	60.40
Total		1141699	379560	33.25	67081	5.88	695058	60.88

(Source: Census of India, 2011)

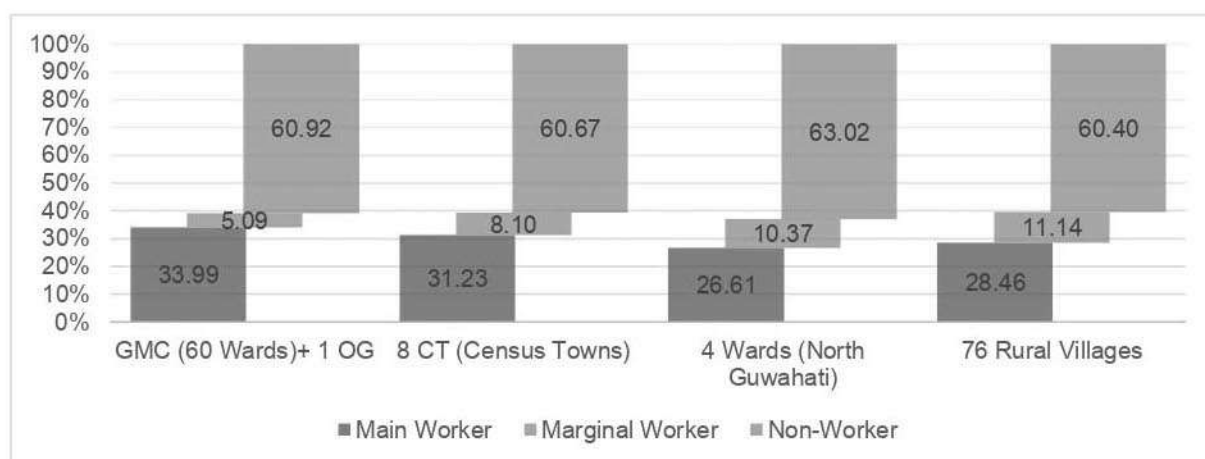


Figure 3-8 Workforce distribution in GMPA by type of work, 2011

The details of share of main, marginal and non-working population of the Guwahati Master Plan Area is furnished in the Table 3-19. This table reveals that around one third (33.25%) of the total population is main workers, very meagre (5.88%) falls under marginal workers and nearly two third (60.88%) is non-workers in Guwahati Planning Area. The Higher share of non-working population indicates that lack of employment opportunities/infrastructure is prevailing in the system. The higher number of main workers to the total population is in GMC area while the lower numbers in villages of rural and North Guwahati area. These phenomenon highlights that there is a shift from rural to urban migration i.e., Push effect from rural area was observed in the system during the year 2011.

3.7.5 Workforce distribution by sectors of economy

Table 3-20 Workforce Distribution by sectors of Economy (2011)

GMPA Area	Main Workers	Primary Sector		Secondary Sector	Tertiary Sector	%		
		Cultivators	Agricultural Labourer	Household Industry Workers	Other Workers	Primary Sector	Secondary Sector	Tertiary Sector
GMC (60 Wards)+ 1 OG	327058	1765	1756	5442	318095	1.08	1.66	97.26
8 CT (Census Towns)	18582	973	316	3727	13566	6.94	20.06	73.01
North Guwahati	2748	11	32	62	2643	1.56	2.26	96.18
79 Rural Villages	31172	5752	2605	2275	20540	26.81	7.30	65.89
Total	379560	8501	4709	11506	354844	3.48	3.03	93.49

(Source: Census of India, 2011)

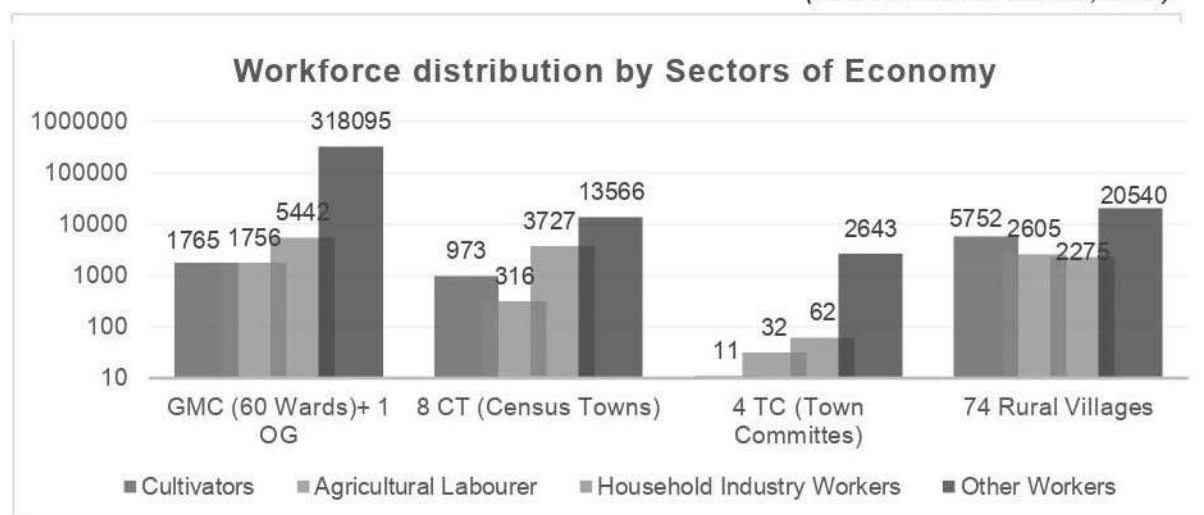


Figure 3-9 Workforce Distribution by sectors of Economy (2011)

The details of workforce distribution by sectors of economy are described in the Table 3-20 reveals that out of the total working population of Guwahati Planning Area, 3.48 % work in the primary sector, very meagre (3.03%) in secondary sector and almost major (93.49%) in tertiary sector. This composition clearly indicates that there is a higher dependency of working population on tertiary sector, followed by primary sector. However, in rural areas, dependency on primary sector is moderate. Guwahati Master Plan Area is mainly dependent on tertiary sector as major commercial and activities are concentrated in and around major commercial stretches and arterials of the city. As there are very less processing industrial establishments such as those that take the raw materials produced by the primary sector and process them into manufactured goods and products, the dependency on secondary sector is also very less.

3.7.6 Workforce Participation 2011

Table 3-21 Workforce Participation 2011

ward	Main workers			Marginal workers			Other workers			Total Workers			Non workers		
	persons	male	female	persons	male	female	persons	male	female	Persons	male	female	persons	male	female
Ward 1	10169	8254	1915	2425	1344	1081	9862	8013	1849	12594	9598	2996	20711	7729	7729
Ward 2	6618	5718	900	912	510	402	6559	5673	886	7530	6228	1302	13747	4524	4524
Ward 3	8145	5553	1592	847	427	420	7921	6431	1490	8992	6980	2012	14265	4801	4801
Ward 4	6863	5617	1246	1118	692	426	6707	5501	1206	7981	6309	1672	12385	4059	4059
Ward 5	9985	7936	2049	2343	1229	1114	9780	7805	1975	12328	9165	3163	20525	7363	7363
Ward 6	12230	10357	1873	2077	1206	871	11483	9768	1715	14307	11563	2744	24950	8626	8626
Ward 7	13908	11050	2858	2652	1188	1464	13296	10644	2652	16560	12738	4322	23435	8419	8419
Ward 8	7464	6605	858	804	458	346	7352	6517	835	8268	7064	1204	14120	4677	4677
Ward 9	5866	5241	625	480	298	182	5780	5181	599	6346	5539	807	10470	3485	3485
Ward 10	7642	5071	1571	935	602	333	7389	5950	1439	8577	6673	1904	12866	4811	4811
Ward 11	7811	5724	2087	1495	882	613	7353	5400	1953	9306	6606	2700	12794	4418	4418
Ward 12	8802	6831	1971	1485	857	628	8670	6748	1922	10287	7688	2599	14156	4965	4965
Ward 13	9008	6867	2141	1804	934	870	8800	6717	2083	10812	7801	3011	14728	5225	5225
Ward 14	8016	6384	1632	1125	623	502	7888	6307	1581	9141	7007	2134	13199	4582	4582
Ward 15	12732	10992	1740	2194	1153	1041	12331	10671	1660	14926	12145	2781	22308	7683	7683
Ward 16	12373	10455	1918	1854	1164	690	12084	10255	1829	14227	11619	2608	22630	7476	7476
Ward 17	11183	8805	2378	1381	713	668	10914	8615	2299	12564	9518	3046	19442	6715	6715
Ward 18	11929	9166	2763	731	371	360	11391	8814	2577	12660	9537	3123	18478	6563	6563
Ward 19	9598	7510	2088	733	471	262	9467	7421	2046	10331	7981	2350	16794	5847	5847
Ward 20	11528	8903	2625	1367	736	631	11299	8737	2562	12895	9639	3256	18827	6764	6764
Ward 21	10630	8150	2480	1604	772	832	10434	8009	2425	12234	8922	3312	17062	6109	6109
Ward 22	12027	10421	1606	2226	1186	1040	11630	10092	1538	14253	11607	2646	23828	8463	8463
Ward 23	8787	7174	1613	542	291	251	8616	7022	1594	9329	7465	1864	15894	5697	5697
Ward 24	12160	10292	1868	2643	1263	1380	11789	9988	1801	14803	11555	3248	24321	8682	8682
Ward 25	14756	11335	3421	3729	1937	1792	14257	10980	3277	18485	13272	5213	25656	9591	9591
Ward 26	14144	10616	3528	2170	1110	1060	13835	10413	3422	16314	11726	4588	22754	8468	8468
Ward 27	9768.5	8446	1322.5	772.5	489	283.5	9439.5	8166	1273.5	10541	8935	1606	19633	6656.5	6656.5
Ward 28	13746	10882.5	2863.5	1686.5	938	748.5	13507	10737	2770	15432.5	11820.5	3612	23278.5	8552.5	8552.5
Ward 29	12487	10159.5	2327.5	1493	829.5	663.5	12181.5	9910.5	2271	13980	10989	2991	23617	8707.5	8707.5
Ward 30	10839	8895.5	1943.5	1904.5	1057	847.5	10681	8777	1904	12743.5	9952.5	2791	20716.5	7379.5	7379.5
Ward 31	12921	10405	2516	2044	1118	926	12584	10152	2432	14965	11523	3442	24151	8861	8861

3.7.7 Employment Projections

3.7.7.1 Workforce Population projections for Guwahati Master Plan area

For workforce estimation the major concerns of the economic base are type of activity, employment rate, work force participation rate (WFPR), occupation structure etc. The overall development and opportunities in a town depend on the level of economic activities in an area. The employment projection for working population for year 2045 is given in the Table 3-22 below.

Table 3-22 Workforce projections of Guwahati Master Plan area for year 2045

Year	Total Projected Population	Total working population	Growth Rate in Working Population	WFPR
1991	707955	227607	-	32.15
2001	990161	343783	39.86	34.72
2011	1141699	446632	15.30	39.12
2021	1475651	599852	29.25	40.65
2031	2024565	861249	37.20	42.54
2041	3151450	1377813	55.66	43.72
2045	3863812	1711282	22.60	44.29

(Source: Compiled by Consultant)

Considering the scenario that the Workforce Participation Rate (WPR) will increase as the Master Plan 2045 projects will be implemented and more job opportunities will be created, the employment projection is calculated. After consecutive discussions with various govt. departments, the employment projection is worked out based on the optimistic scenario. Thus, the workforce participation rate for year 2045 is coming around 44.29%, which was 39.12% in year 2011 as per Census 2011. The total projected working population in Guwahati Master Plan area for the horizon year 2045 is 1711282.

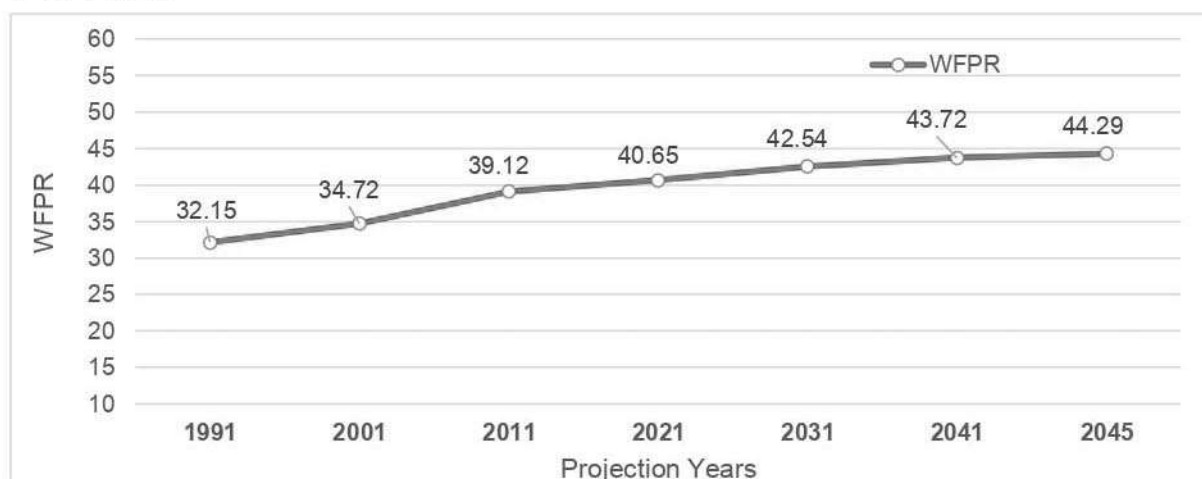


Figure 3-10 Projection of Work Force Participation Rate for year 2045

3.7.7.2 Sector wise projection of working population - 2045

For the year 2045 in Guwahati the total workforce projected is 17,11,282 out of which primary sector contributes to 92,511 which is about 57.9%, secondary sector contributes to 4367 of about 2.7% and about 62,836 of about 39.3% is contributed by tertiary sector. Sector wise Workforce Participation for different plan phases is indicated in the table below.

Table 3-23 Sector wise workforce participation projection for year 2045

Activity	2011		2021		2031		2041		2045	
	Workers		Workers		Workers		Workers		Workers	
	No.	%	No.	%	No.	%	No.	%	No.	%
Primary	18982	4.25	26,753	4.46	35742	4.15	54837	3.98	64686	3.78
Secondary	17508	3.92	22,794	3.80	31005	3.60	48223	3.50	59895	3.50
Tertiary	410142	91.83	5,50,304	91.74	794502	92.25	1274753	92.52	1586701	92.72
Total	446632	100	599852	100	861249	100	1377813	100	1711282	100
WFPR	39.12		40.65		42.54		43.72		44.29	

(Source: Compiled by Consultant)

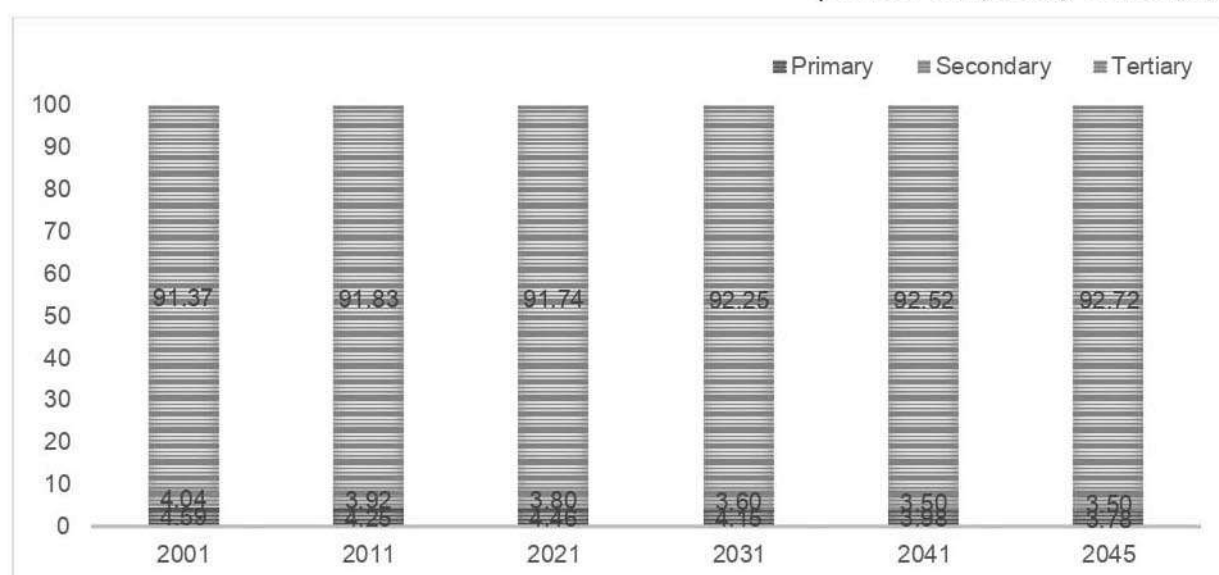


Figure 3-11 Sector wise workforce participation projection for year 2045

From the Figure 3-11 it is observed that the working population in tertiary sector is steadily increasing from year 2011 to 2045. This steady growth in the tertiary working population is projected considering increasing opportunity in the Trade, Tourism, Hotels & Restaurants, Transport, Storage & Communication, Banking and Informal sector. As a part of reducing the agriculture land withing planning area people started active participation by the grass root level service sectors and entrepreneur ships which would improve the relevance and the quality of the sector. In year 2045 the tertiary sector population seems to increase to satisfactory level.

3.7.8 Ward wise Occupational Classification of Main Workers, 2011.

Table 3-24 Ward wise occupational data 2011

Ward	Cultivators			Agricultural workers			Household industry			Other workers		
	persons	male	female	persons	male	female	persons	male	female	persons	male	female
Ward 1	62	43	19	116	110	6	129	88	41	9862	8013	1849
Ward 2	6	5	1	21	18	3	32	22	10	6559	5673	886
Ward 3	24	17	7	33	25	8	167	80	87	7921	6431	1490
Ward 4	28	20	8	31	20	11	97	76	21	6707	5501	1206
Ward 5	25	20	5	42	28	14	138	83	55	9780	7805	1975
Ward 6	274	204	70	147	122	25	326	263	63	11483	9768	1715
Ward 7	110	82	28	96	77	19	406	247	159	13296	10644	2652
Ward 8	12	11	1	43	40	3	57	38	19	7352	6517	835
Ward 9	16	9	7	20	16	4	50	35	15	5780	5181	599
Ward 10	32	19	13	28	17	11	193	85	108	7389	5950	1439
Ward 11	210	148	62	182	132	50	66	44	22	7353	5400	1953
Ward 12	19	11	8	25	20	5	88	52	36	8670	6748	1922
Ward 13	96	79	17	30	20	10	82	51	31	8800	6717	2083
Ward 14	34	12	22	36	27	9	58	38	20	7888	6307	1581
Ward 15	49	18	31	21	13	8	331	290	41	12331	10671	1660
Ward 16	54	16	38	23	14	9	212	170	42	12084	10255	1829
Ward 17	72	47	25	34	29	5	163	114	49	10914	8615	2299
Ward 18	41	27	14	72	53	19	425	272	153	11391	8814	2577
Ward 19	29	17	12	36	30	6	66	42	24	9467	7421	2046
Ward 20	26	16	10	15	13	2	188	137	51	11299	8737	2562
Ward 21	31	21	10	37	23	14	128	97	31	10434	8009	2425
Ward 22	50	38	12	104	89	15	243	202	41	11630	10092	1538
Ward 23	5	5	0	9	8	1	157	139	18	8616	7022	1594
Ward 24	41	29	12	66	53	13	264	222	42	11789	9988	1801
Ward 25	186	144	42	122	84	38	191	127	64	14257	10980	3277
Ward 26	36	24	12	56	41	15	217	138	79	13835	10413	3422
Ward 27	40	35	5	62.5	57	5.5	226.5	188	38.5	9439.5	8166	1273.5
Ward 28	57	32	25	58	37	21	124	76.5	47.5	13507	10737	2770
Ward 29	57	44.5	12.5	73.5	67	6.5	175	137.5	37.5	12181.5	9910.5	2271
Ward 30	21	13	8	28	22	6	109	83.5	25.5	10681	8777	1904
Ward 31	32	27	5	63	52	11	242	174	68	12584	10152	2432

(Source: Census 2011)

4. EXISTING LANDUSE ANALYSIS - 2020

Land is the habitat of men, and its wide use is crucial for the economic, social, and environmental advancement of all countries. Land is partitioned for administrative and economic purposes, and it is used and transformed in a myriad way. Land use is the use of land made by man. It is broad and important term used to classify land according to its use. Land use is commonly used to refer the spatial distribution of functions in each area. The study of land use holds a very significant place where a particular settlement can be recognized as a town depends on its functional structure. The functional activity can be regarded as the main regions for the growth of an urban centre. The main purpose of land use study is to provide framework for the development of a particular area. it gives us an idea about the proportion of various types of land. Landuse give an accurate picture of an urban area which is having a great significance for future planning. The main purpose of land use classification is to provide framework for the development of a particular area. The need for studying the land use aspect is elaborated as follows: To know the arrangement of various parts of town put to different uses such as residential, commercial, industrial etc. To provide standardize distribution of land use. Land use study provides the framework for the development of a particular area and direction of development. It gives us an idea about the proportion of various types of use of land.

As part of the preparation of GIS Based Master Plan - 2045, an extensive existing land use survey was carried out for the entire Guwahati Planning Area. The Existing Land Use was updated based on ground reality on the scientific base map prepared with the help of Satellite Image and Revenue records like village level cadastral sheets, Field Measurement Book sheets and Town Survey Sheets. The Guwahti Planning Area is administratively divided into two entities, Urban and Rural. Urban area comprises Municipal Corporation area, North Guwahati Municipal Board, 8 Census Towns and 1 Outgrowth and Rural comprises 79 Villages. This chapter presents the existing landuse analysis, 2020 for urban, rural and overall planning area. Further the existing land use analysis of the proposed conurbation area is also discussed to understand the current scenario of the new conurbation area.

4.1 Conurbation Area

The Conurbation area is a continuous urban area comprising of towns and their outgrowths merged with each other due to physical expansion and population growth. In the case of Guwahati, conurbation area includes one municipality area namely Guwahati Municipal Corporation, one Municipal board namely North Guwahati Municipal Board, 8 Census Towns and Narengi outgrowth area. The total Conurbation area is 213.2 sq.km, out of which GMC comprise 176.17 sq.km, North Guwahati of 3.89 and CTs comprises 33.16 sq.km. area. The detailed existing land use analysis of conurbation is presented in Table 4-2. GMC is bound by Brahmaputra River & Bonda-Kharguli on the Northeast, Mikirpara Chakardda & Mirzapur on the western side and Garbhanga and Rani Reserve Forest on the southern side.

Table 4-1 Details of Guwahati Conurbation Area

Sr. No	Description	Details
1	Area	213.22 sq.km.
2	Gross Density	4840 person / square km. (48 pph)
3	Net Density	13910 person / square km (139 pph)
4	Location	Southern Part to Brahmaputra (Major)
5	Major Landmarks	Guwahati railway Station, Kamakhya Railway Station, Fancy Bazar, Paltan Bazar, Uzan Bazar, Kamakhya Temple, Deepor bill, Guwahati Medical Collage and Hospital, Cantonment, Stadiums, Zoo, Museum, Digholi pukhuri, District Jail, FCI Godown, Kalakhshetra, Panduport, High court, Janta Bhavan, Gandhi Mandap, Guwahati University, etc.

(Source: Compiled by Consultant)

The most predominant and oldest landmarks in the Guwahati Municipality area are the Paltanbazar, Panbazar, Fancybazar and Uzanbazar, forming the core around which Guwahati city has expanded. The core area is bound by MG Road on the North-West, AT Road on the South-West, Maniram Dewan Road on the East and Guwahati-Shillong (GS) Road as the most important Southward corridor of the city. City's major commercial activities lies along the GS Road, Maniram Dewan Road, RGB Road, Hati Gaon Road, Beltola Road, Lokhra Road, Jaya Nagar Road and AK Deb road. Another major landmark in this precinct is the Kamakhya Temple which is an oldest divine destination for the local as well as floating population. Assam State Zoo, Assam State Museum, Srimanta Sankardeva Kalakshetra, Planetarium, Umananda & Navagrah temple are also other major recreational landmarks located in GMC area.

Table 4-2 Existing Landuse Analysis for Urban Guwahati-2020

Sr. No.	LULC Classes	Area (sq.km)	Percentage (%)
1	Residential	74.20	34.80
2	Commercial	5.30	2.49
3	Industrial	2.82	1.32
4	Mixed	2.51	1.18
5	Educational	3.50	1.64
6	Health Service	1.38	0.65
7	Central Govt.	4.07	1.91
8	State Govt.	3.59	1.68
9	Public And Semi Public	2.45	1.15
10	Religious	0.60	0.28
11	Railway Property	0.80	0.37
12	Transportation & Traffic Related	11.50	5.39
13	Public Utility	0.27	0.13
14	Solid Waste Management	0.22	0.11
15	Communication	0.06	0.03
16	Heritage	0.27	0.13
17	Slum	0.76	0.36
18	Recreational	1.71	0.80
19	Agriculture	6.83	3.20
20	Vacant Land	27.56	12.93
21	Green Areas (Tree Clad Areas, Hill)	41.35	19.39
22	Mining Area	0.03	0.01
23	Wetlands	7.12	3.34
24	Wastelands	3.34	1.57
25	Eco Sensitive Area	3.61	1.69
26	Water Bodies	6.56	3.08
27	Aquaculture	0.69	0.32
28	Others (Dairy Farm, Brick Kiln, Gaushala, Poultry Farm, Quarry)	0.16	0.08
Total		213.22	100

The existing land use analysis chart for Urban Guwahati - 2020 is presented in Figure 4-1. In urban area, 74.20 sq.km of land is under residential use and it is the predominant land use in this region. Traffic & Transportation occupies 11.50 sq.km of area in urban Guwahati. Hills and Green cover occupy 41.35 sq.km. Vacant land use is of 27.56 sq.km and Waterbody is 6.56 sq.km, agricultural land use is 6.83 sq.km of the urban area. The Public & Semi-Public land use covers 2.45 sq.km in the urban area. The commercial land use in the urban area is occupying 5.30 sq.km, mixed landuse is 2.51 and industrial landuse is observed 2.82 sq.km. The Existing land use Map - 2020 for the entire urban area is illustrated in Figure 4-2.

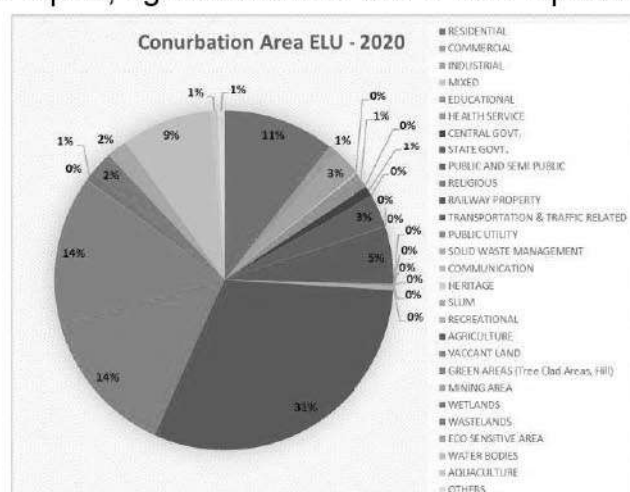


Figure 4-1 Existing Land Use Analysis Chart for Urban Guwahati -2020

4.1.1 Residential

The residential land use is the predominant use in urban area and it covers 74.20 sq km of area which is around 34.80 % of the total area of the Conurbation area. Residential use is dominant on the Southern and central part of the Guwahati City and it is one of the oldest residential settlement within the Guwahati Municipality. Other major settlement contributing to the residential use in the urban area are Uzan Bazar, Athgaon, Chandmari, Silpukhri, Gandhi Basti, Sarania, Bamuni Maidan, Manipuri, Kahilipara, Lachit Nagar, kumar Para, Santipur, Adabari, Hengrabari, Panjabari, Maligaon, Dhirenpara, Hati Gaon and Gitanagar which are major residential area in this municipality. Tekela Chiring and Barbari are other revenue villages contributing to the residential land use.

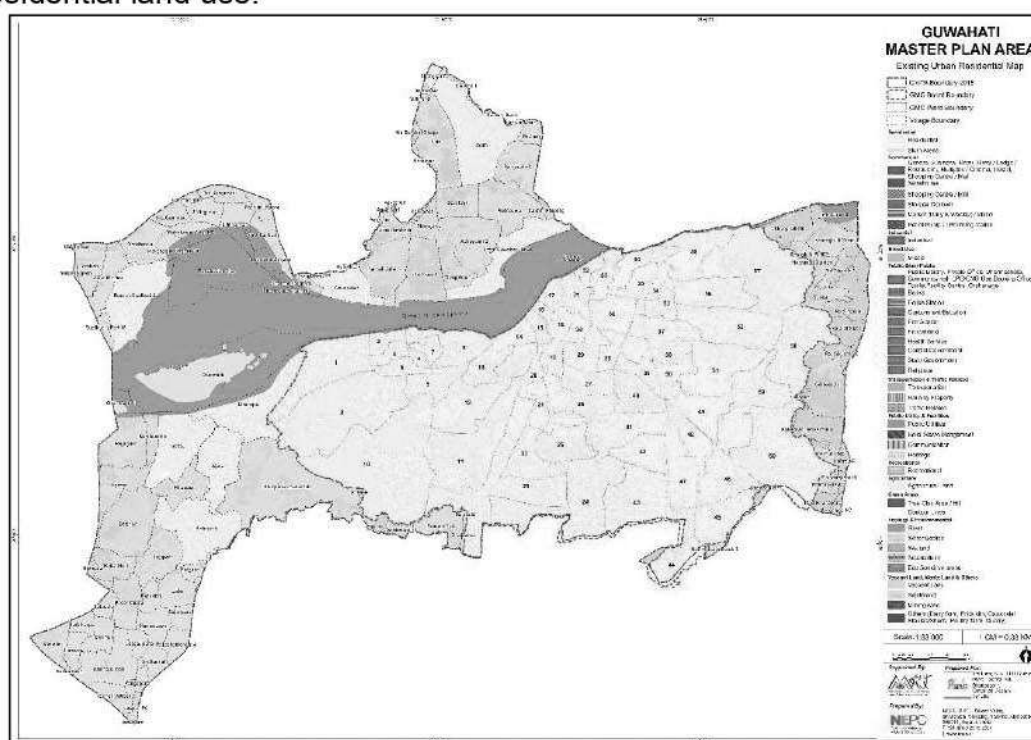


Figure 4-3 Residential Landuse – Guwahati Conurbation 2020

4.1.2 Commercial

The commercial land use in the urban area accounts to 2.49% (5.30 sq.km.) of the total area of the Conurbation. The CBD of the Guwahati region is contiguous area of Paltan Bazar, Fancy bazar, Pan Bazar and Uzan Bazar which is the major contributor for the commercial land use in this Municipality area. Other than the CBD, commercial land use is observed on the southern corridor of the city which is GS Road and surroundings. Predominant commercial use is found on both the sides of NH 27, Beltola Street and road and Lokhra Road within the Guwahati Municipality.

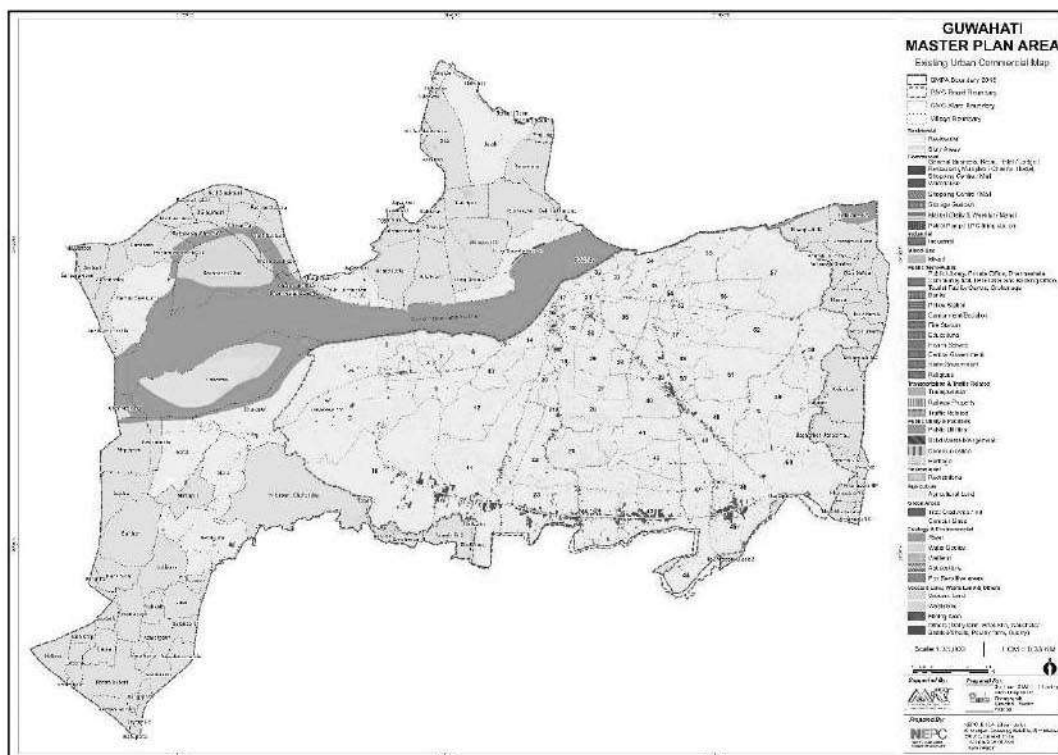


Figure 4-4 Commercial Landuse – Guwahati Conurbation 2020

4.1.3 Industrial

The Industrial Landuse cover is around 2.82 sq.km of the Conurbation area which accounts to 1.32% of the total area of the conurbation. Out of this, major portion is under Oil India Ltd. petroleum refinery which is fully functional and generates the scope of employment. Assam Tubes Ltd. and Brahmaputra Industrial Park is also industrial contributor located at North Guwahati.

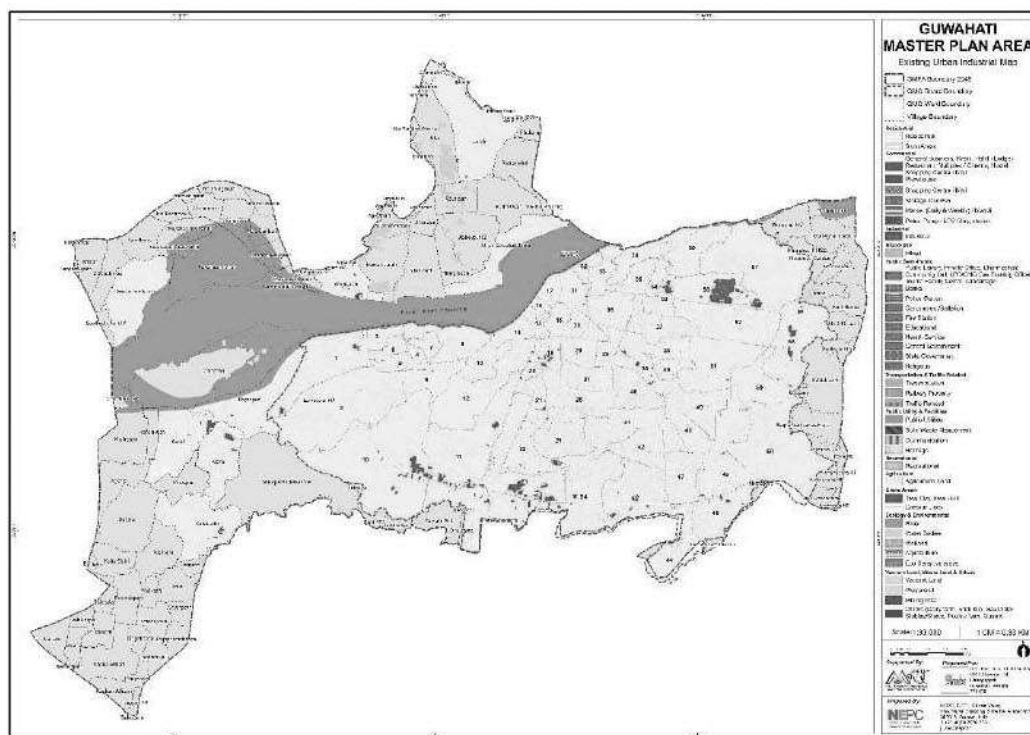


Figure 4-5 Industrial Landuse – Guwahati Conurbation 2020

4.1.4 Public & Semi-Public

The Public & Semi-public Landuse in the urban area is about 2.54 sq.km which is around 1.15 % of the total area of the Conurbation. The city accommodates several government offices like DC Office, GMC, GMDA, NERF Railway Colonies, Cantonment, High Court, Janta Bhavan, Legislative Assembly, Department of Revenue, Public Works Department, GMCH, Guwahati University, AMC, etc. Further, it has been observed that there are good number of religious buildings like Temples, Churches & Mosques which contributes to the Public & Semi-Public landuse of the Conurbation area.

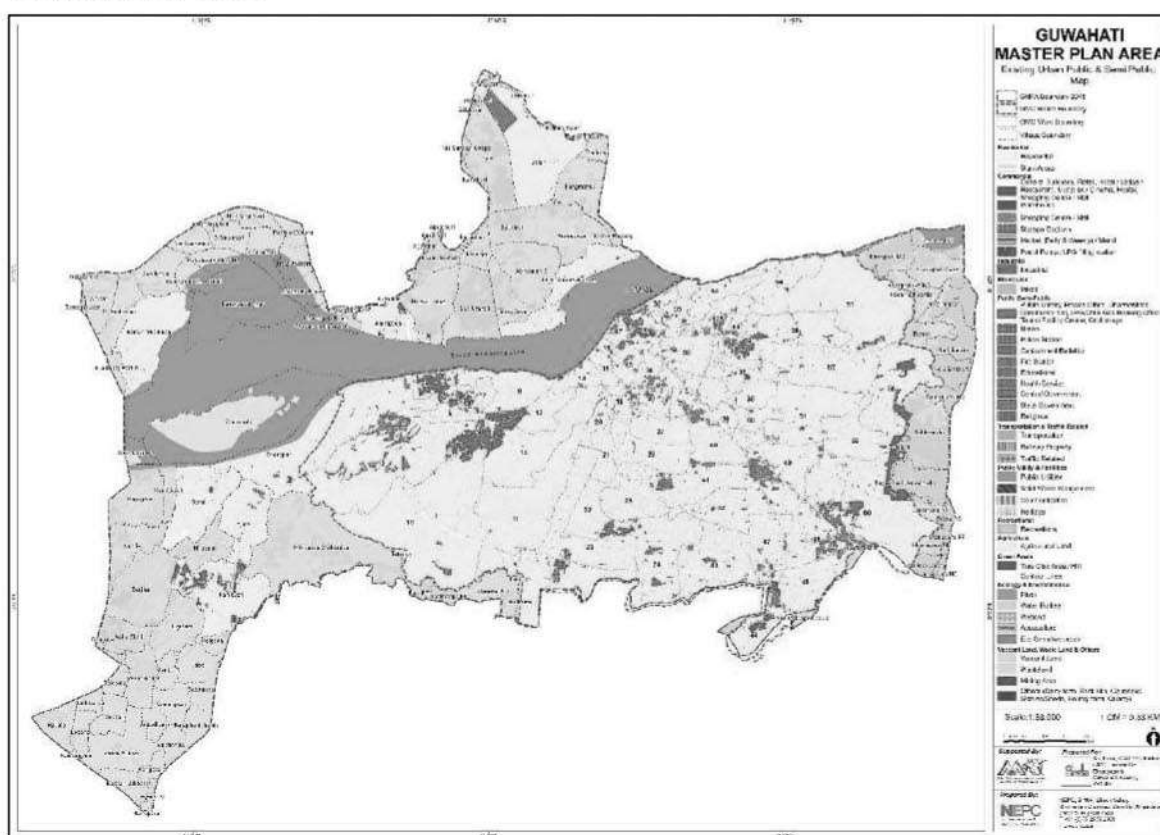


Figure 4-6 Public & Semi-Public Landuse – Guwahati Conurbation 2020

4.1.5 Open Spaces

The recreational land use within the urban area accounts to 2.58 sq.km which is around 1.21% of the total area of the Conurbation. The important recreational sites within this area are Modern National Sport Complex (Sarusajai) on NH 27, Barsapara Stadium, Hockey Stadium, Judges Field & Nehru Park in core city area, Shankardeva Kalakshetra at Panjabari, Shraddhanjali Kanan opposite to Zoo, Latasil Field, Nehru stadium at B. Borooah Road and Sport's Authority of India complex at Paltan Bazar.

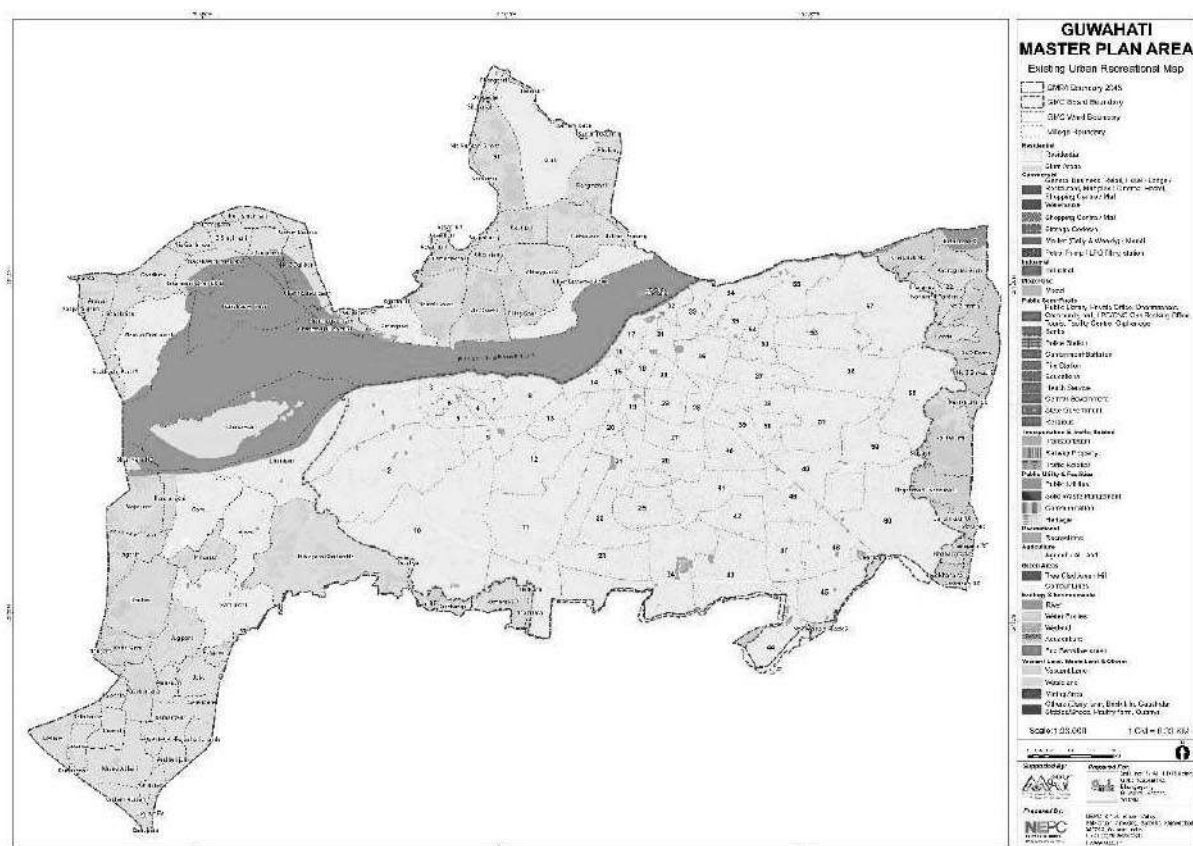


Figure 4-7 Transportation Landuse – Guwahati Conurbation 2020

4.1.6 Traffic & Transportation

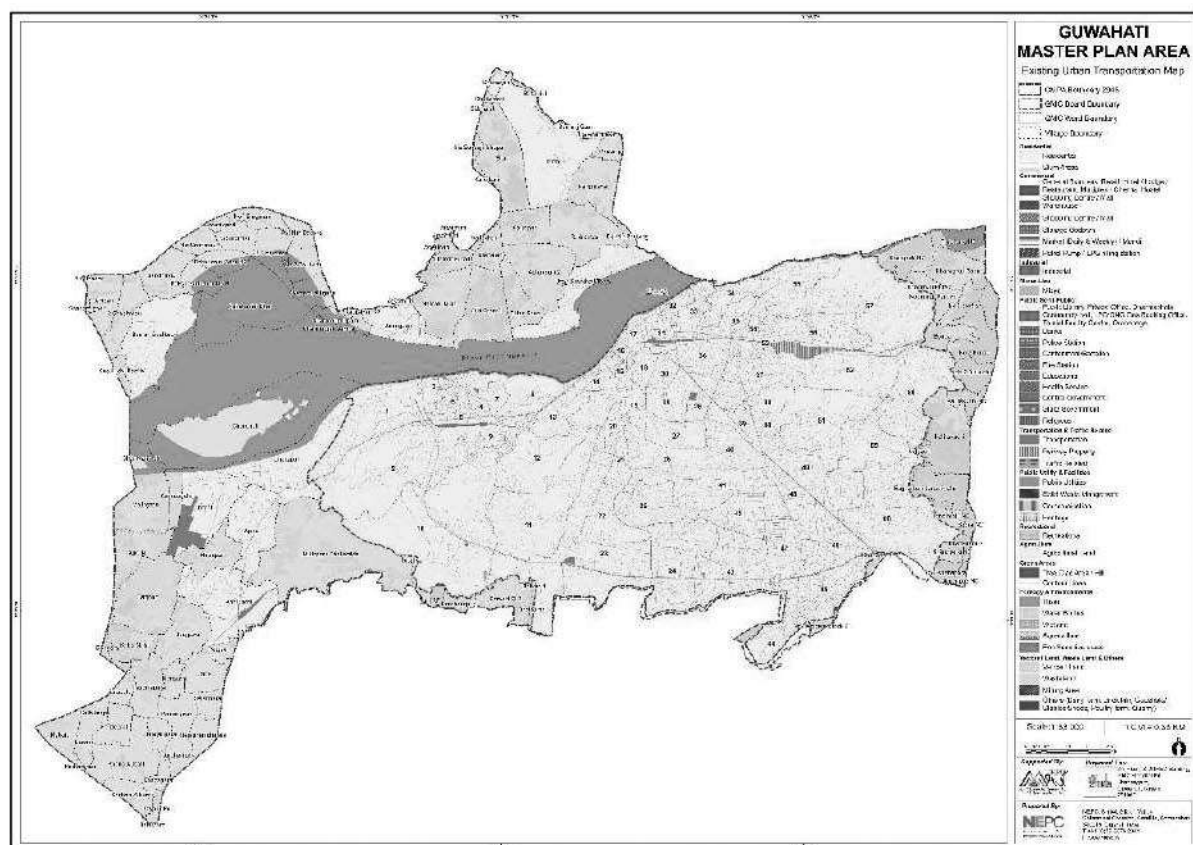


Figure 4-8 Recreational Landuse – Guwahati Conurbation 2020

4.1.7 Vacant

In urban region around 27.56 Sq.km of land is vacant as on year 2020, which accounts for 12.93% land of the total area. Major vacant parcels are located in the ward No. 23, 24 and 10 which are Lokhra, Ahom Gaon, Betkuchi and Garchuk village areas. Dharapur, Garal, Ajara and Kahikuchi are also census towns where a lot of land is developed into layouts and are currently lying vacant. On north side of Brahmaputra Amingaon, Jalah and North Guwahati are new developing vacant regions being census towns. These lands can be utilized for addressing the future needs of the planning area for the plan period.

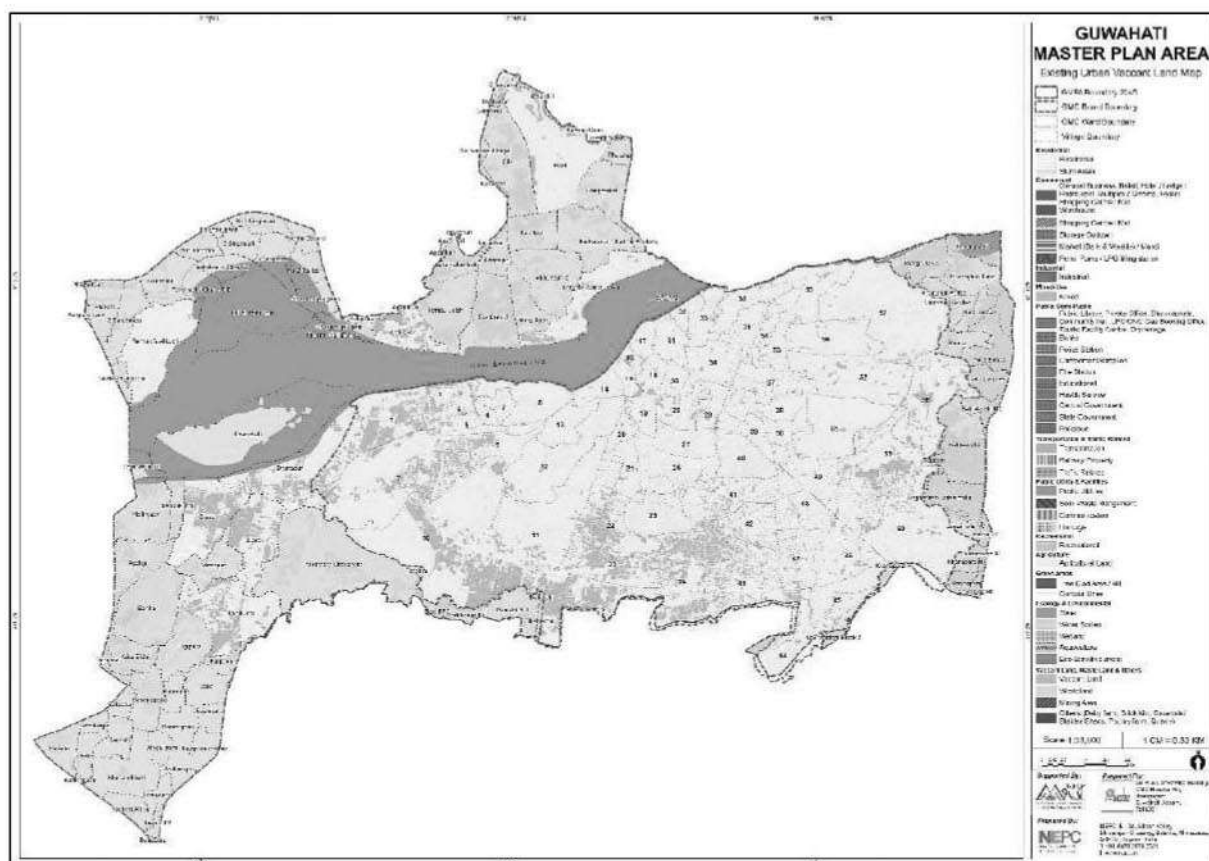


Figure 4-9 Vacant Land use – Guwahati Conurbation 2020

Table 4-3 Ward wise vacant lands within GMC Area - 2020

SI No.	Ward No.	Vacant Land Area (ha)	SI No.	Ward No.	Vacant Land Area (ha)
1	Ward 1	175	31	Ward 31	2.3
2	Ward 2	178	32	Ward 32	0.4
3	Ward 3	23	33	Ward 33	4
4	Ward 4	0.7	34	Ward 34	2.5
5	Ward 5	6.7	35	Ward 35	2.5
6	Ward 6	9	36	Ward 36	3.4
7	Ward 7	0.5	37	Ward 37	10
8	Ward 8	3	38	Ward 38	7
9	Ward 9	30	39	Ward 39	6
10	Ward 10	275	40	Ward 40	3
11	Ward 11	20	41	Ward 41	48
12	Ward 12	11	42	Ward 42	26.6
13	Ward 13	0.6	43	Ward 43	97
14	Ward 14	1.2	44	Ward 44	20
15	Ward 15	5	45	Ward 45	26
16	Ward 16	6.6	46	Ward 46	17
17	Ward 17	2	47	Ward 47	24
18	Ward 18	7.7	48	Ward 48	5
19	Ward 19	1.4	49	Ward 49	13
20	Ward 20	4	50	Ward 50	2
21	Ward 21	4.6	51	Ward 51	6
22	Ward 22	83	52	Ward 52	17
23	Ward 23	310	53	Ward 53	5
24	Ward 24	280	54	Ward 54	5
25	Ward 25	6	55	Ward 55	9
26	Ward 26	6	56	Ward 56	7
27	Ward 27	0.3	57	Ward 57	14
28	Ward 28	7.8	58	Ward 58	56
29	Ward 29	16	59	Ward 59	82
30	Ward 30	2	60	Ward 60	70
				Total	2066.8

(Source: Compiled by consultant)

It can be inferred from above mentioned analysis that major vacant land parcels are located in outer peripheral areas from core city centre due to high demand near CBDs and prime commercial corridors. The Table 4-3 mentions ward wise availability of vacant land within GMC area.

4.1.8 Protected & Undevelopable Use

Guwahati conurbation area has 59.33 sq.km. of area falling under protected and undevelopable land use zone. Which is 27.82% of Guwahati conurbation area. Majority of the area falling under this category is covered by Hills, Reserved forests, Wetlands, Waterbodies and Brahmaputra riverbed.

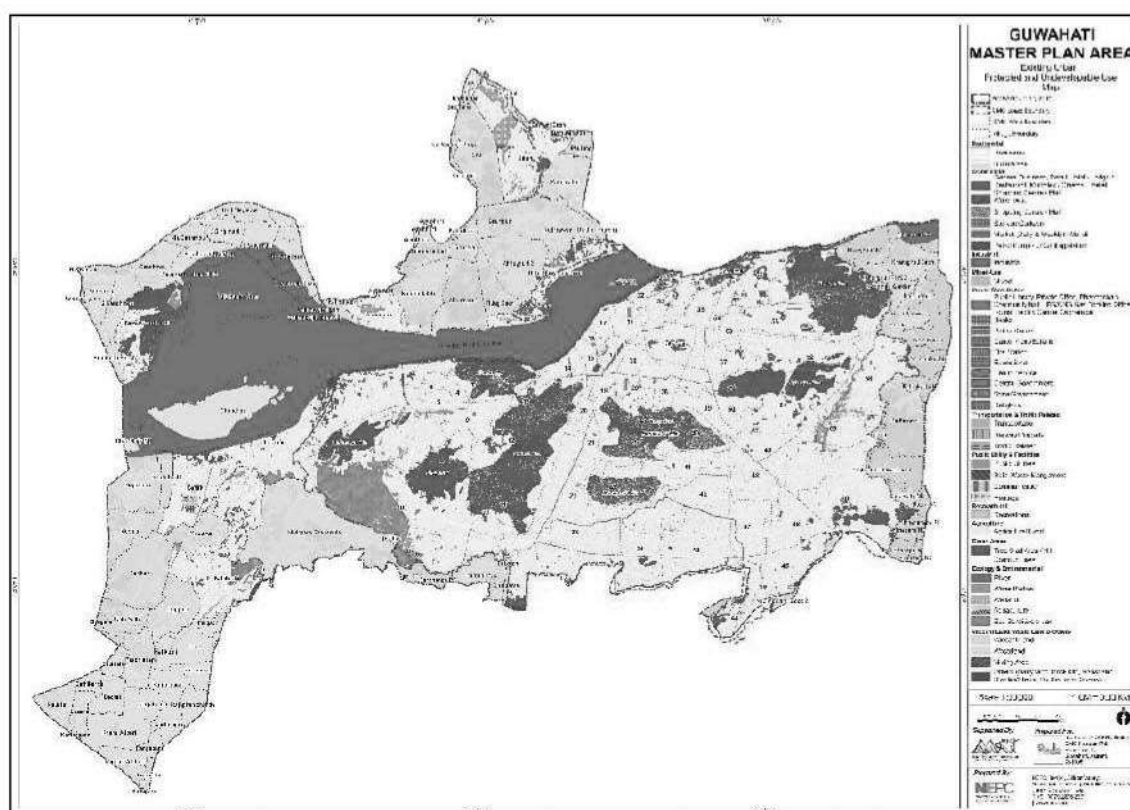


Figure 4-10 Protected and Undevelopable Landuse – Guwahati Conurbation 2020

4.2 Rural Area

Guwahati Planning Area accommodates total 79 villages as rural area. The total area covered by rural region is 114.78 sq.km., which is 35% of entire Guwahati Master Plan Area 2045. The rural areas are scattered into three land pockets North Guwahati, East Guwahati and West Guwahati. 33 villages from North Guwahati, 17 villages from East Guwahati and 26 villages from West Guwahati. The detailed existing land use analysis of Guwahati Rural Area - 2020 is presented in Table 4-5.

Table 4-4 Details of Guwahati Rural Area

Sr. No	Description	Details
1	Area	114.78 sq.km.
2	Gross Density	954 person/sq. km. (9 pph)
3	Net Density	8978 person/sq. km. (89 pph)
4	Location	North, West and East of City Centre
5	Major Landmarks	IIT Guwahati, Borjhar LGBI Airport, Don Bosco University, Deepor Bill, Army Cantonment Kalitakuchi, Airport Cantonment

One of the predominant Landmark in the rural Guwahati is the IIT Guwahati which is a National academic institution lies on north bank of Brahmaputra. LGBI Airport at Borjhar and Army Cantonment are also important landmark located in west part of rural Guwahati. Deepor Bill as Assam's only Ramsar site and bird sanctuary, is a major tourist attraction which is surrounded by Rani reserve forest on south and Jalukbari reserve forest on north.

The existing land use analysis

chart for rural area - 2020 is presented in Figure 4-11. In rural area, 35.37 sq.km of land is under Agricultural use and it is the predominant land use in this region. Tree clad and Green area occupies 16.35 sq.km of area. Residential area occupies 12.20 sq.km of land and Industrial land use occupies 2.93 sq.km of area in rural area. Wetland and Waterbody occupies 10.78 sq.km area and Vacant land use is around 16.14 sq.km. Commercial land use is 1.10 sq.km of the rural area. The Public & Semi-Public land use covers 6.59 sq.km in the

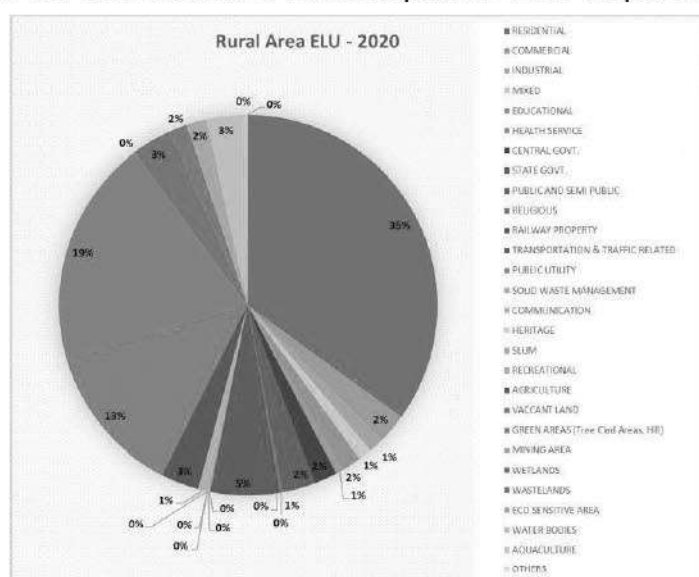


Figure 4-11 Existing Land Use Analysis - 2020, Rural Area

rural area. The mixed land use is 0.21 sq.km and recreational land use is observed 0.51 sq.km. The existing land use Map - 2020 for the entire rural area is illustrated in Figure 4-12.

Table 4-5 Existing Landuse Analysis for Rural Guwahati-2020

Sr. No.	LULC Classes	Area (sq.km)	Percentage
1	Residential	12.20	10.63
2	Commercial	1.10	0.96
3	Industrial	2.93	2.55
4	Mixed	0.21	0.18
5	Educational	1.58	1.38
6	Health Service	0.12	0.10
7	Central Govt.	1.13	0.98
8	State Govt.	0.11	0.10
9	Public And Semi Public	3.55	3.09
10	Religious	0.10	0.09
11	Railway Property	0.00	0.00
12	Transportation & Traffic Related	6.14	5.35
13	Public Utility	0.19	0.17
14	Solid Waste Management	0.01	0.01
15	Communication	0.0008	0.00
16	Heritage	0.001	0.00
17	Slum	0	0.00
18	Recreational	0.51	0.44
19	Agriculture	35.37	30.82
20	Vaccant Land	16.14	14.06
21	Green Areas (Tree Clad Areas, Hill)	16.35	14.24
22	Mining Area	0.06	0.05
23	Wetlands	0.88	0.77
24	Wastelands	2.38	2.07
25	Eco Sensitive Area	2.25	1.96
26	Water Bodies	9.90	8.63
27	Aquaculture	0.84	0.73
28	Others (Dairy farm, Brick kiln, Gaushala, Poultry farm, Quarry)	0.73	0.64
Total		114.78	100

4.2.1 Residential

The residential land use is the less occupied use in rural area which covers 12.20 sq km of area which is around 10.63 % of the total area of the rural Guwahati. Residential use is scattered and located on the northern, western and eastern part of the GMPA.

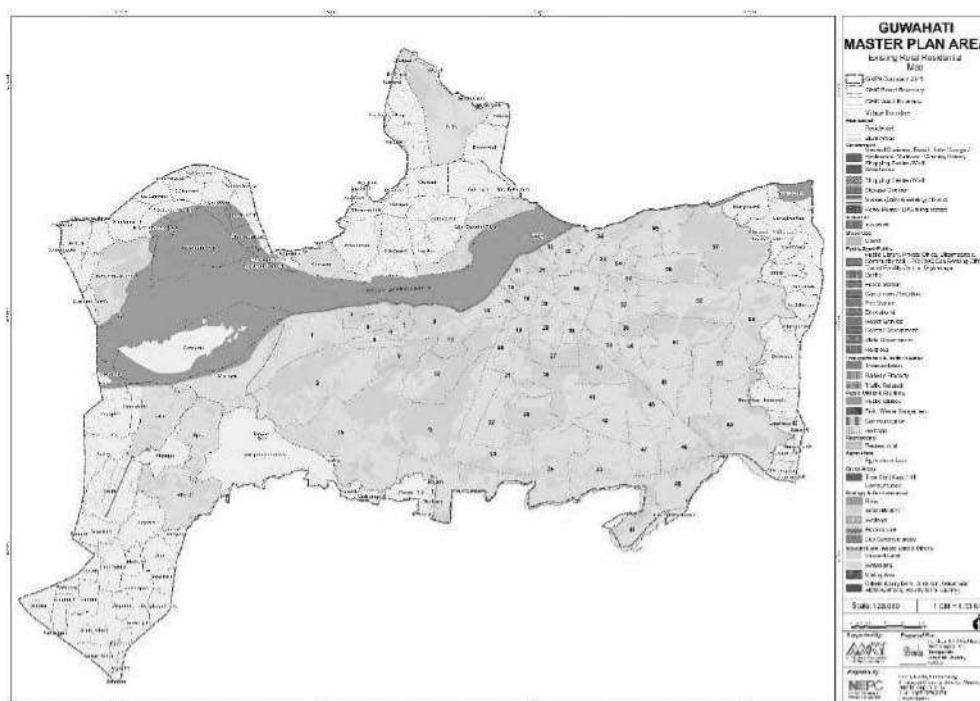


Figure 4-13 Existing Residential Landuse - Rural area 2020

4.2.2 Commercial

The commercial land use in the rural guwahti accounts to 0.96% (1.10 sq.km.) of the total area of the villages.

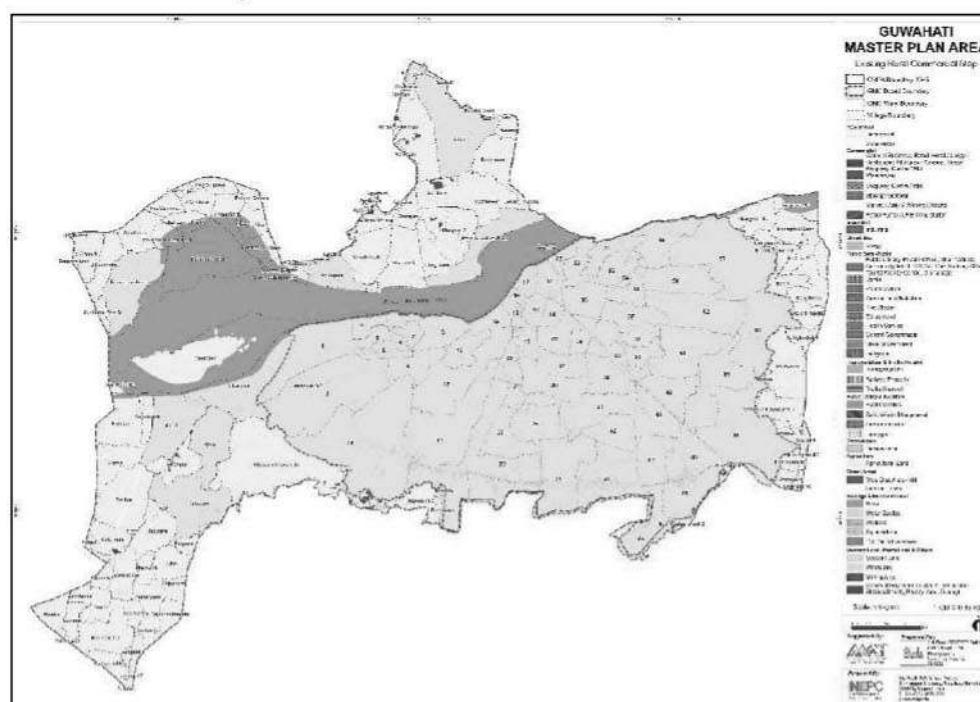


Figure 4-14 Existing Commercial Landuse - Rural area 2020

The Industrial Landuse covers around 2.93 sq.km of the rural area which accounts to 2.55 % of the total area of the Villages. Out of this, major portion is under Brahmaputra Industrial Park on North Guwahati which is currently fully operational, and this provides good employment opportunity for economic development of the region.

Figure 4-15 Existing Industrial Landuse - Rural Area 2020

The Public & Semi-public Landuse in the rural area is about 6.59 sq.km which is around 5.74 % of the total area of the village area. The rural area accommodates IIT Guwahati as major public institution, Cantonments of Airport and Army at Kalitakuchi.

Figure 4-16 Existing Public and Semi-Public Land use - Rural Area 2020

4.2.5 Open Spaces

The recreational land use within the rural area accounts to 0.51 sq.km which is around 0.44% of the total area of the region. The important recreational sites within the rural area are Umananda river Island, Saraighat lake at Amingaon, Numati jalah Indoor stadium and Cricket ground and Saraighat War Memorial at Agyathuri.

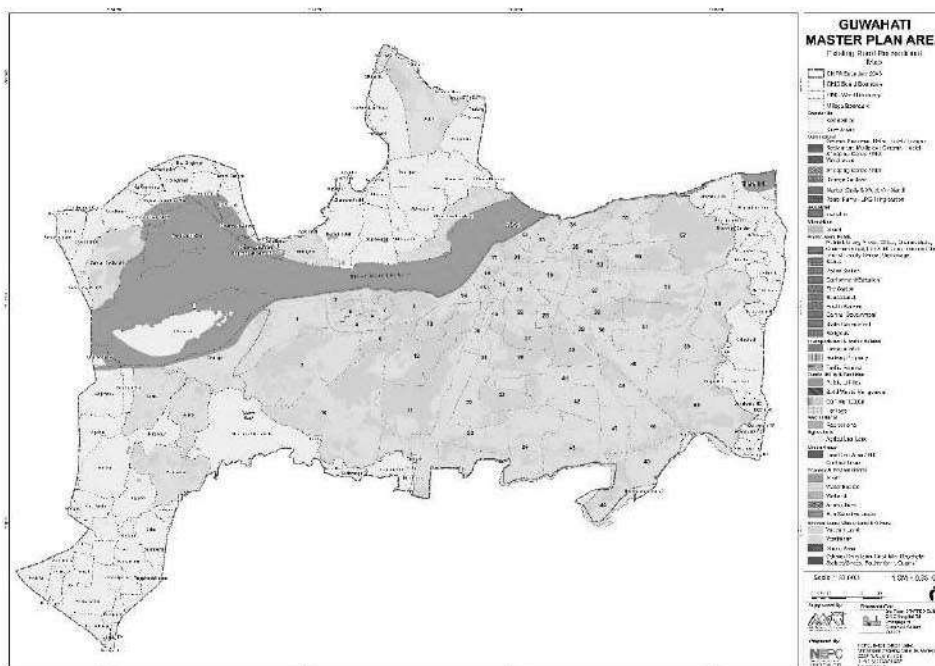


Figure 4-17 Existing Open Space Land Use- Rural Area

4.2.6 Traffic & Transportation

Traffic & Transportation covers 6.14 sq.km which is around 5.35 % of the total area of rural land cover. Large land parcels coming under the traffic & transportation land use in this area is Borjhar LGBI Airport.

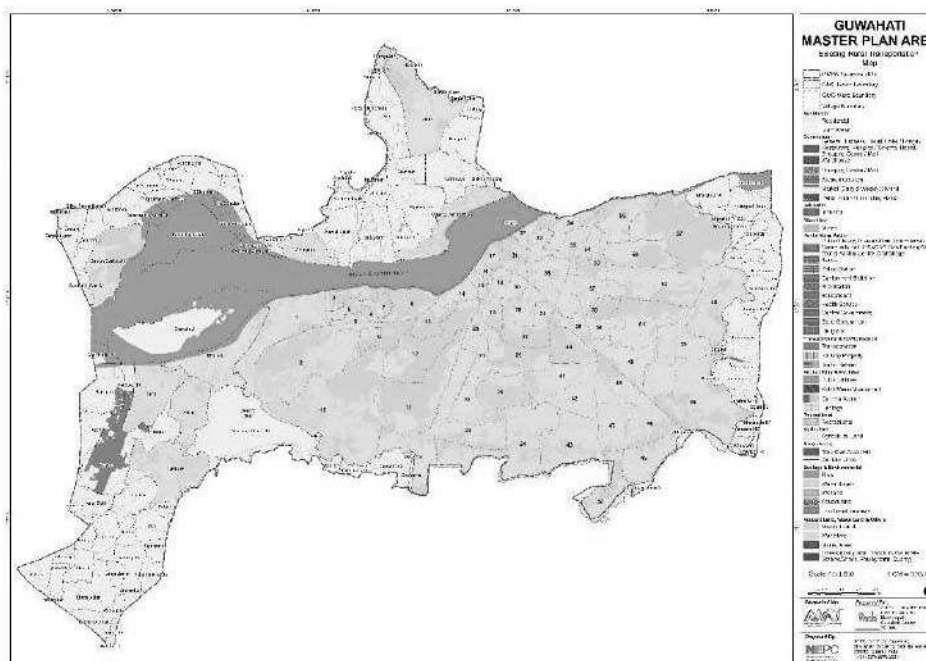


Figure 4-18: Existing Rural Transportation Infrastructure Map

4.2.7 Vacant

In Guwahati rural around 16.14 sq.km of land is vacant as on year 2020, which accounts for 14.06% land of the total rural area.

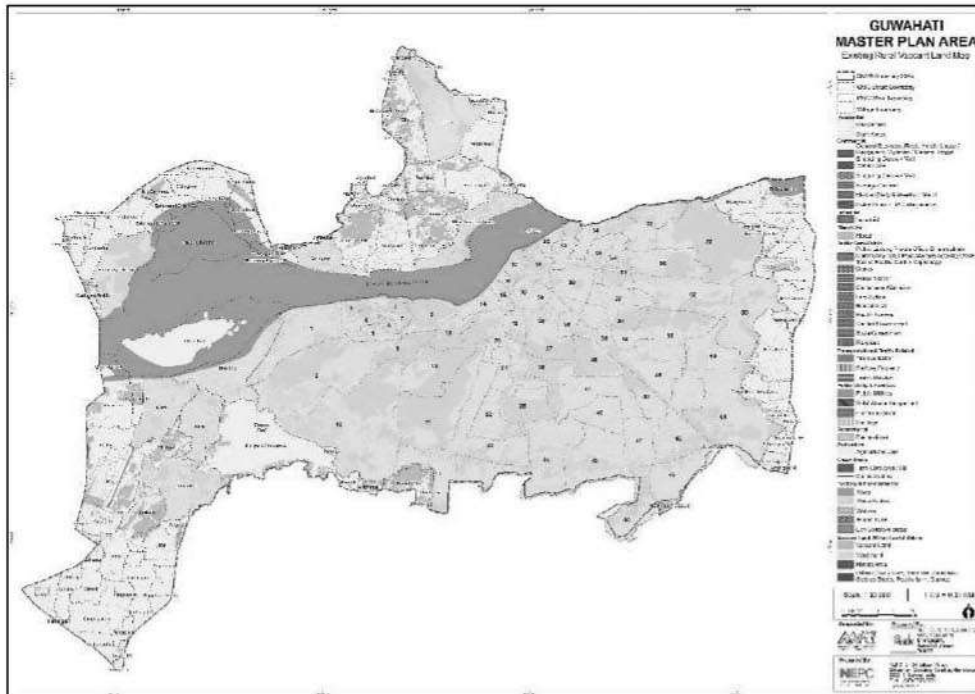


Figure 4-19 Existing Transportation Land Use - Rural Area

4.2.8 Protected & Undevelopable Use

Rural Area has 30.22 sq.km. of area falling under protected and undevelopable land use zone. Majority of the area falling under this category is covered by Green covers and Tree clad area of Hills and Reserve Forest, Waterbodies, and Wetlands.

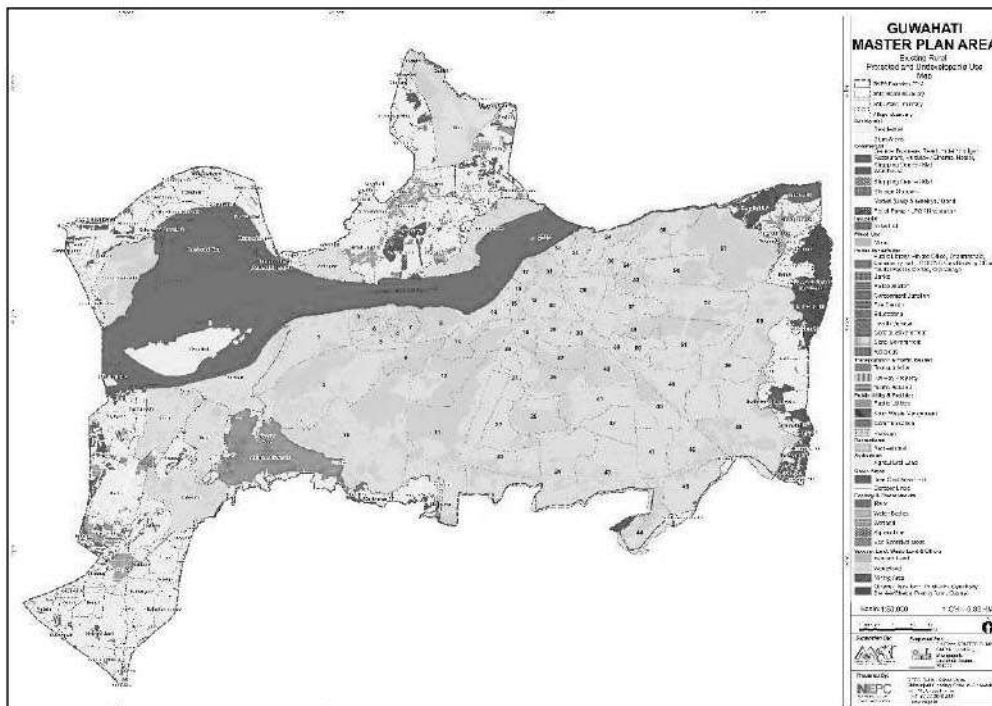


Figure 4-20 Existing Undevelopable Landuse - Rural Area 2020

4.3 Guwahati Planning Area - 2020

The overall existing land use analysis chart for Guwahati Planning Area - 2020 is shown in Figure 4-21. Residential land use occupies 26.34% of the total area of the Guwahati Planning Area, Agriculture occupies around 12.87 % of the land use area and Green area (Tree clad, Reserve forest and Hills) covers 17.59% of total land area of the planning area. About 13.32% of the planning area is currently lying vacant, 5.38% is under traffic and transportation use, 1.95% is occupied by commercial areas, 1.75% is in industrial land use category and 1.83% of the Guwahati Planning Area land is under Public and Semi-Public land use.

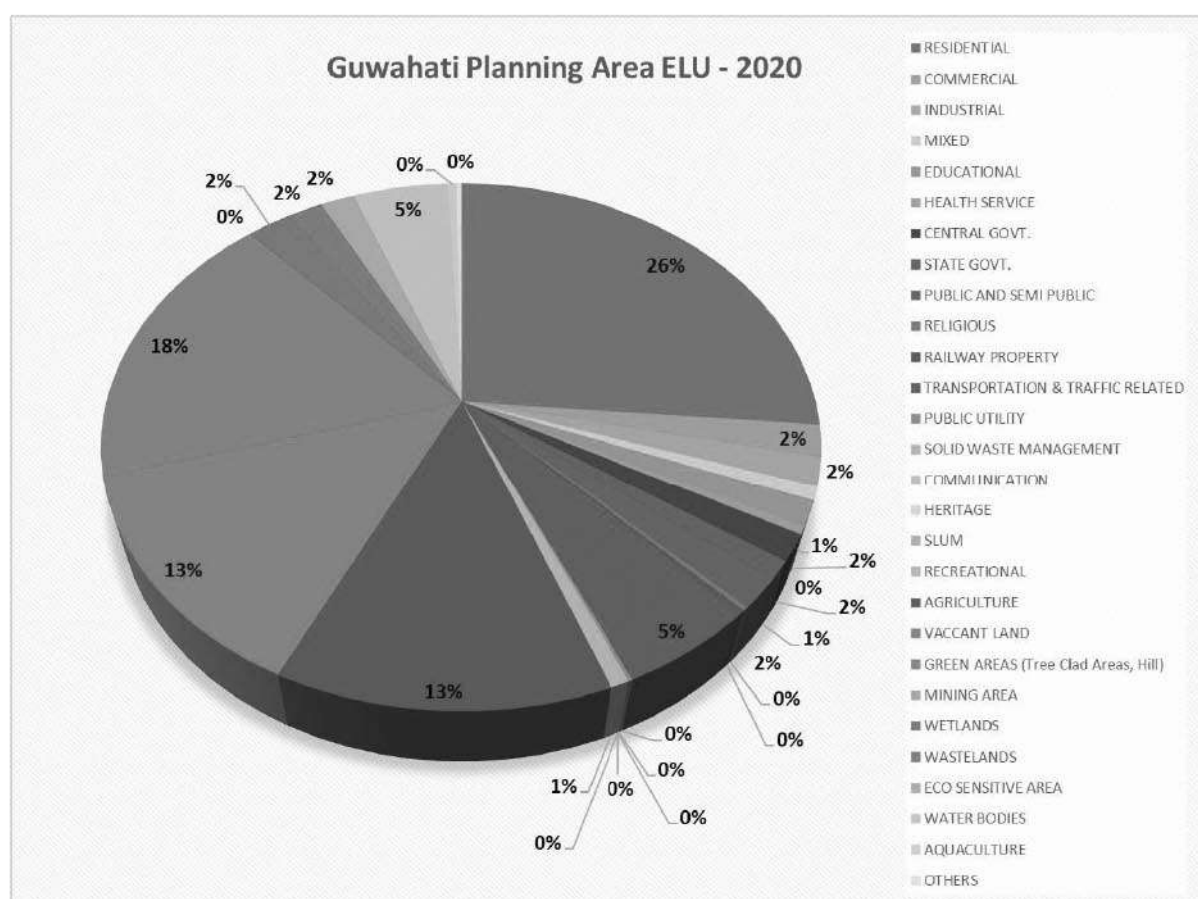


Figure 4-21 Landuse breakup of Guwahati Planning Area - 2020

Details of Existing Land Use analysis-2020 is shown in Table 4-6. Residential land use being the predominant land use in the planning area occupies 86.40 sq.km area, Waterbody or Protected and Undevelopable use is spread over 89.55 sq.km, agriculture use covers 12.87 sq.km and 13.32 sq.km is currently vacant. Priority should be given to utilize the vacant land to address the future residential requirements of the planning area and compacting the development should be kept as a key point in the preparation of GIS Based Master Plan-2045 to avoid sprawl.

Table 4-6 Existing Land Use Analysis of Guwahati Planning area 2020

Sr. no	LULC Classes	Area (sq.km)	Percentage (%)
1	Residential	86.40	26.34
2	Commercial	6.40	1.95
3	Industrial	5.75	1.75
4	Mixed	2.72	0.83
5	Educational	5.08	1.55
6	Health Service	1.50	0.46
7	Central Govt.	5.20	1.59
8	State Govt.	3.70	1.13
9	Public And Semi Public	6.00	1.83
10	Religious	0.70	0.21
11	Railway Property	0.80	0.24
12	Transportation & Traffic Related	17.64	5.38
13	Public Utility	0.46	0.14
14	Solid Waste Management	0.23	0.07
15	Communication	0.06	0.02
16	Heritage	0.271	0.08
17	Slum	0.76	0.23
18	Recreational	2.22	0.68
19	Agriculture	42.20	12.87
20	Vacant Land	43.70	13.32
21	Green Areas (Tree Clad areas, Hill)	57.70	17.59
22	Mining Area	0.09	0.03
23	Wetlands	8.00	2.44
24	Wastelands	5.98	1.82
25	Eco Sensitive Area	5.86	1.79
26	Water Bodies	16.46	5.02
27	Aquaculture	1.53	0.47
28	Others	0.89	0.27
Total		328.00	100

(Source: Compiled by Consultant)

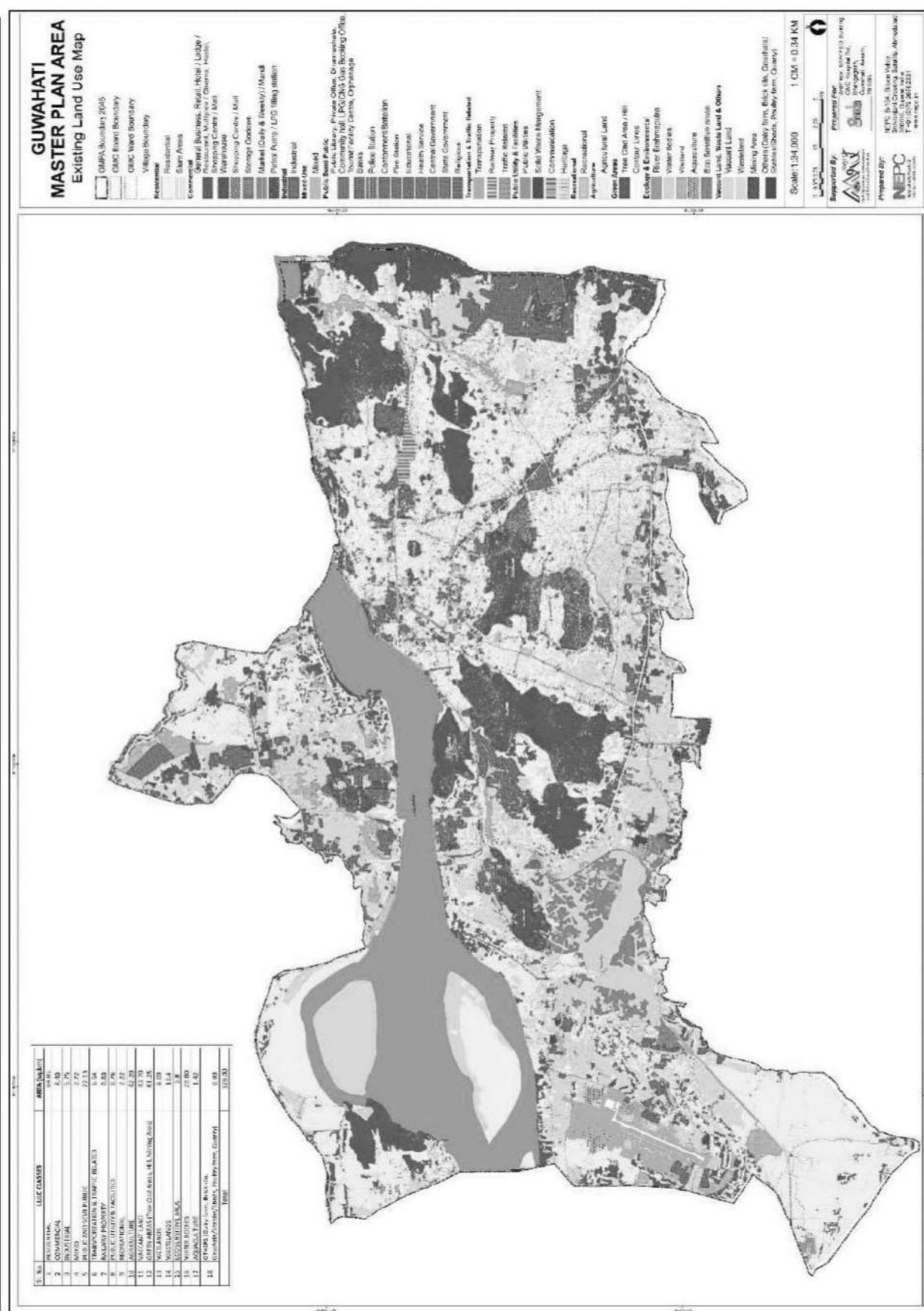


Table 4-7 Comparative ELU 2020 - Analysis of Conurbation and Rural Guwahati area

Sr. No.	LULC Classes	Conurbation (sq.km)	Rural (sq.km)	GMPA (sq.km)
1	Residential	74.2	12.2	86.40
2	Commercial	5.3	1.1	6.40
3	Industrial	2.82	2.93	5.75
4	Mixed	2.51	0.21	2.72
5	Educational	3.5	1.58	5.08
6	Health Service	1.38	0.12	1.50
7	Central Govt.	4.07	1.13	5.20
8	State Govt.	3.59	0.11	3.70
9	Public And Semi Public	2.45	3.55	6.00
10	Religious	0.6	0.1	0.70
11	Railway Property	0.799	0.001	0.80
12	Transportation & Traffic Related	11.5	6.14	17.64
13	Public Utility	0.27	0.19	0.46
14	Solid Waste Management	0.224	0.006	0.23
15	Communication	0.0592	0.0008	0.06
16	Heritage	0.001	0.001	0.27
17	Slum	0.76	0	0.76
18	Recreational	1.71	0.51	2.22
19	Agriculture	6.83	35.37	42.20
20	Vacant Land	27.56	16.14	43.70
21	Green Areas (Tree Clad Areas, Hill)	41.35	16.35	57.70
22	Mining Area	0.03	0.06	0.09
23	Wetlands	7.12	0.88	8.00
24	Wastelands	3.34	2.64	5.98
25	Eco Sensitive Area	3.61	2.25	5.86
26	Water Bodies	6.56	9.9	16.46
27	Aquaculture	0.69	0.84	1.53
28	Others	0.16	0.73	0.89
Total		213.22	114.78	328.00

(Source: Compiled by Consultant)

The Existing Land Use area for entire GMPA as well as for two categories is presented in the table above. As it is observed from the table that in conurbation area, there is very less vacant area available which indicates that Guwahati has no further scope of development. Thus, for the core city the focus is to conserve the existing buildings or redevelopment in conformity with the heritage importance and special regulations for urban area.

While concentrating on the rural area it has good amount of Agriculture and Vacant area which opens up the scope for development in the area. Additionally, it has large amount of area falling under residential and Public & Semi-public categories making it clear that the inflow of people is already there due to various employment reasons.

However, conurbation area is located near to CBD and includes area which are observing good amount of development, it is envisaged that the conurbation area will have the highest development in the upcoming years.

As observed from the table above, in the areas outside of conurbation, major land is under agricultural and vacant use as this is rural area. Thus, more than 40% of the area falls under agriculture and vacant use followed by tree clad and hill areas. Very less area is covered for residential, commercial, industrial etc.

5. TRAFFIC AND TRANSPORTATION

It is known that Urban Transport is the drivers of the Urban Economy and is a one of the necessity of the urban dwellers. Also, transportation plays a vital role towards the mobility of goods & services within the Urban area. Considering that a growing share population will be living in cities, urban transportation issues are of foremost importance to support the mobility of passengers urban area.

Transportation in urban areas is highly complex because of the modes involved, the multitude of origins and destinations, and the amount and variety of traffic. Traditionally, the focus of urban transportation has been on passengers as cities were viewed as locations of utmost human interactions with intricate traffic patterns linked to commuting, commercial transactions, and leisure/cultural activities. However, cities are also locations of production, consumption, and distribution, which are linked to freight mobility. Conceptually, the urban transport system is intricately linked with urban form and spatial structure. Urban transit and different Transport modes are an important dimension of mobility, notably in high-density areas.

Transportation modes are essential components of transport systems since they are the means of supporting mobility. Modes can be grouped into three broad categories based on the medium they exploit: land, water, and air. Each mode has its own requirements and features and is adapted to serve the specific demands of freight and passenger traffic. This gives rise to marked differences in how the modes are deployed and utilized in different parts of the world. More recently, there is a trend towards integrating the modes through intermodality and linking the modes ever more closely into production and distribution activities. At the same time, however, passenger and freight activity is becoming increasingly separated across most modes. However, the as the Guwahati master plan 2045 is concern with the mobility and the assessibility of the Urban population within the development area of Guwahati, a major significance has been provided to passenger movement at inter-city and intra-city level.

Guwahati due to geographical context enjoys different modes of Transport. The various transport modes prevailing in Guwahati are as follows:

1. Air

- Scheduled
- Charter

2. Road

- Car
- Taxi
- Buses/Van
- Autorickshaw/E-Rickshaw
- Cycle rickshaws (also known as pedicabs or trishaws)
- Bicycle
- Walking

3. Rail

- Intercity Trains

4. Maritime

- Ferry

5. Rope way and Cable way

5.1 Regional Accessibility and Connectivity

Guwahati is called the gateway to the seven northeast states of India. The city is well connected to Northeastern major cities such as Imphal, Agartala, Aizwal, Shillong and to the rest of India through roads, rail, and air connectivity. The Guwahati city is major metropolitan area in the North-east region of India.

5.1.1 Interstate Connectivity (from Guwahati)

Guwahati is connected to major cities of Assam and other states of India by road and rail. Table 5-1 manifest the time taken (in hrs.) and distance (in km) from Guwahati to important cities of Assam and other states by different modes of transportation.

Table 5-1 Interstate modes of transportation from Guwahati

Connectivity from Guwahati	Distance (km)	Time (hrs.)		
		By Road	By Rail	By Air
Itanagar	347	8 hrs	11 hrs	1.2 hrs
Kohima	350	7.5 hrs	6 hrs	1 hr
Imphal	484	10.5 hrs	12 hrs	1.2 hrs
Aizawl	583	11 hrs	9 hrs	1.4 hrs
Shillong	99	2 hrs	-	1.3 hrs
Siliguri	474	9.2 hrs	7 hrs	1 hr
Gangtok	539	11.4 hrs	10 hrs	1 hr
Patna	937	17 hrs	15 hrs	1.4 hrs
Kolkata	1035	22 hrs	20 hrs	1.5 hrs

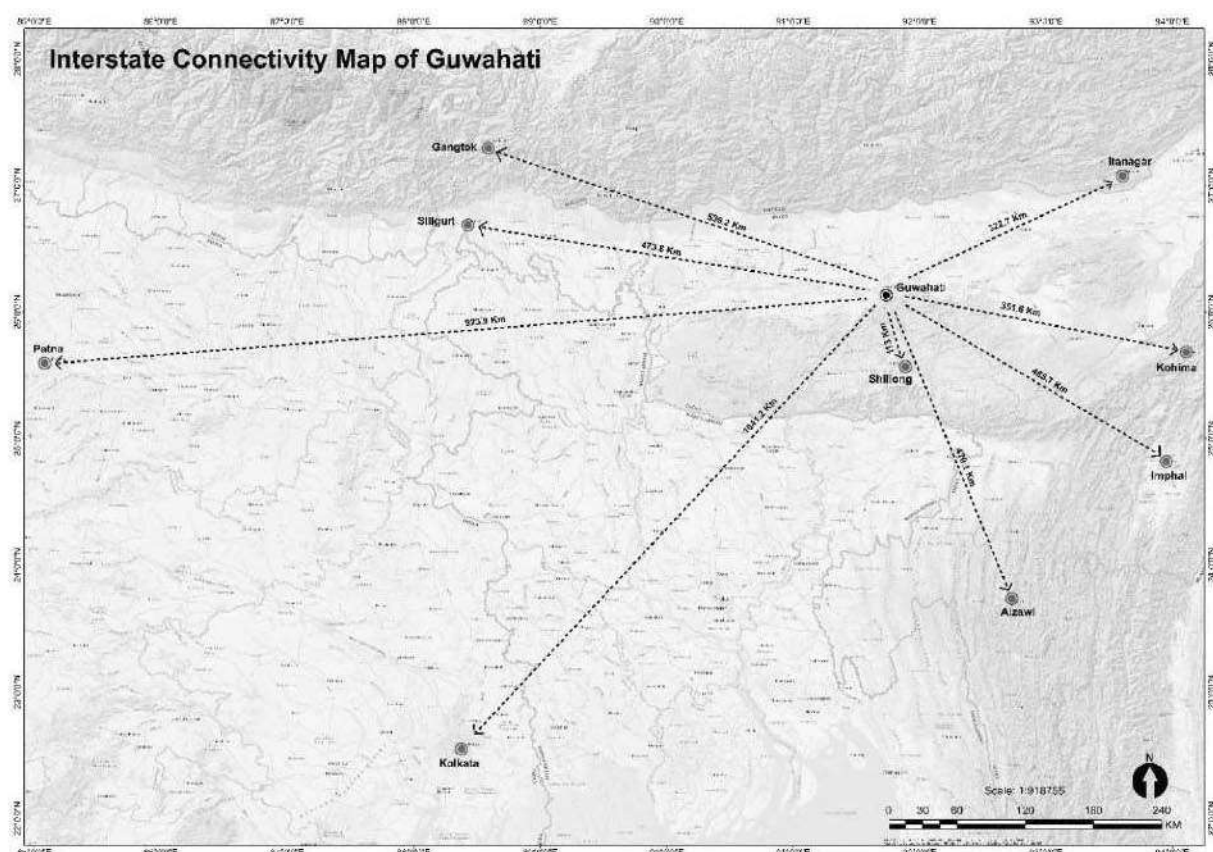


Figure 5-1 Interstate Connectivity from Guwahati

Shillong is the nearest major city from Guwahati which covers minimum distance i.e., 99 km compared to other important urban centers. Other important cities of different states like Kohima, Imphal, Patna and Kolkata are accessible from Guwahati which takes approx. 7-20 hrs by road. Figure 5-1 represents geographical connectivity of Guwahati to other State regions.

5.1.2 Intercity Connectivity (from Guwahati)

Guwahati has the intercity connectivity by road as well as by rail. Table 5-2 below shows the various modes of transportation and its connectivity with the nearest cities like Dibrugarh, Tezpur, Tinsukia, Jorhat and Silchar. The minimum connecting distance is 122 kilometers from Guwahati to Nagaon and maximum is 486 kilometers from Tinsukia.

Table 5-2 Intercity modes of transportation from Guwahati

Urban centres from Guwahati	Distance (km)	Duration (in hrs)	
		By Road	By Rail
Dibrugarh	442	9 hrs	8 hrs
Tezpur	180	3 hrs	5 hrs
Tinsukia	486	10 hrs	11.5 hrs
Silchar	303	8 hrs	13.2 hrs
Nagaon	122	2 hrs	2.5 hrs
Jorhat	304	6 hrs	7.4 hrs

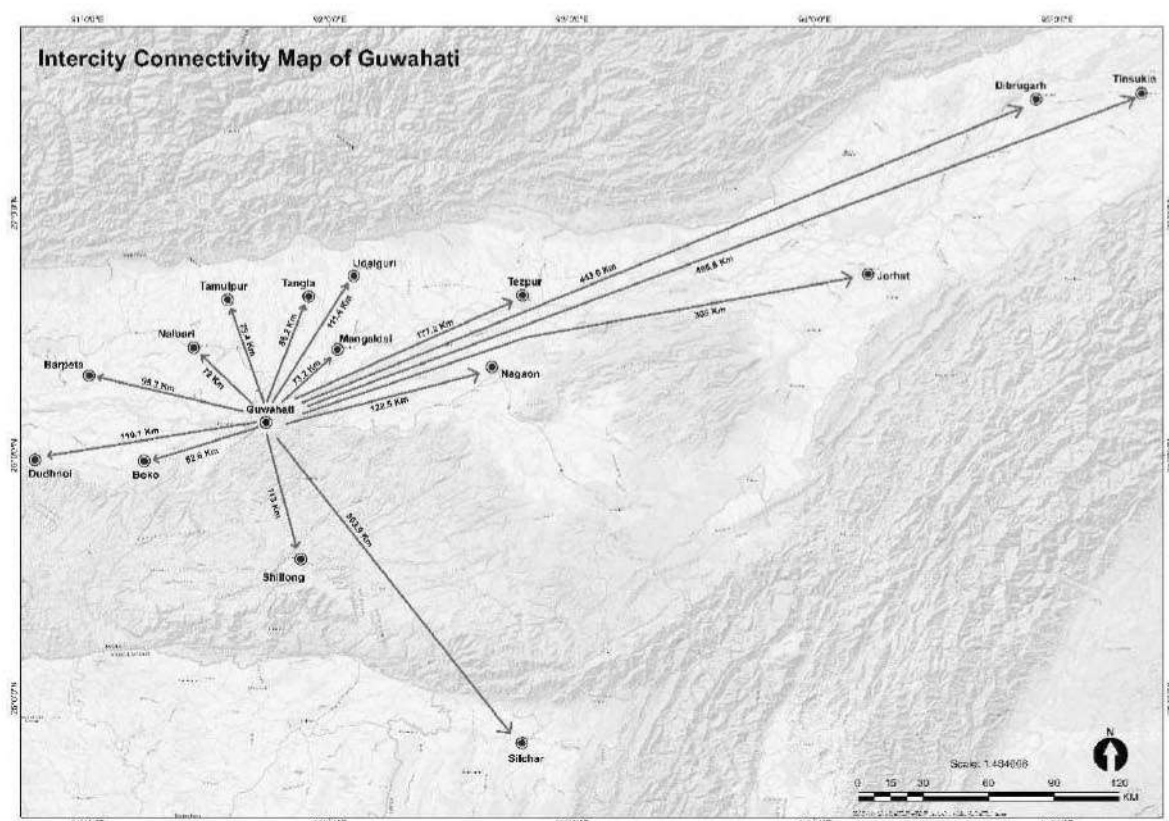


Figure 5-2 Intercity connectivity

5.1.3 Waterway Connectivity (from Guwahati)

Apart from road, rail, air, Guwahati is connected via waterways also and that is National Waterways – 2 which has length of 891 kilometers. Pandu port on South bank of Guwahati is fixed major ferry terminal for interstate trade services. Along with that the terminals have also been mentioned in Table 5-3 below. Figure 5-3 is the graphical representation of National Waterways-2 integrating the important towns on the bank of Brahmaputra.

Table 5-3 National Waterways terminals

Name	Length (km)	Terminals
National Waterways - 2	891	Dhubri, Jogighopa, Pandu (Fixed terminals), Tejpur, Silghat, Neamati, Dibrugarh, Sengajan, Panbari, Sadiya, Saikhowa

(Source: Compiled by Consultants)

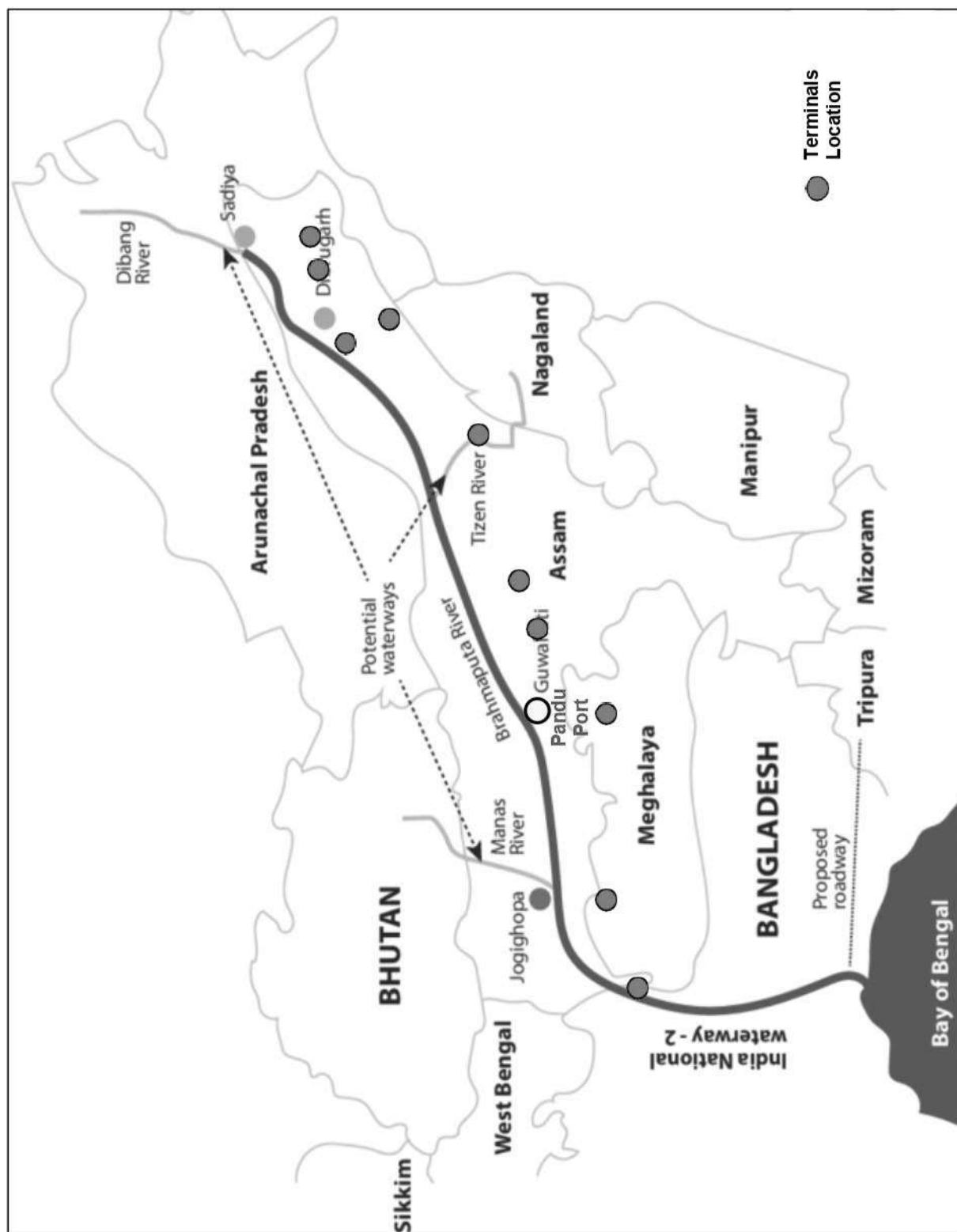


Figure 5-3 Waterway connectivity from Guwahati

5.2 Transport Modes

5.2.1 Airways

Guwahati is exceptionally well connected with the air connectivity. The dense air connectivity makes it a gateway city to the northeast state. Direct flights are operational from and to all the major cities of India to Guwahati. Domestic flights are operational from Delhi, Mumbai, Bangalore,

Kolkata, Ahmedabad, Pune, Jaipur, Lucknow, Patna, Bagdogra, Shillong, Dibrugarh, Agartala, Aizwal, Dimapur, Silchar, Tezpur and Jorhat. Also, six destinations where international flights from the Guwahati airport are Bangkok, Singapore, Dhaka, Yangon, Kathmandu and Kuala Lumpur. Approximately 1700 flights are operational from Guwahati every month.



Guwahati International Airport



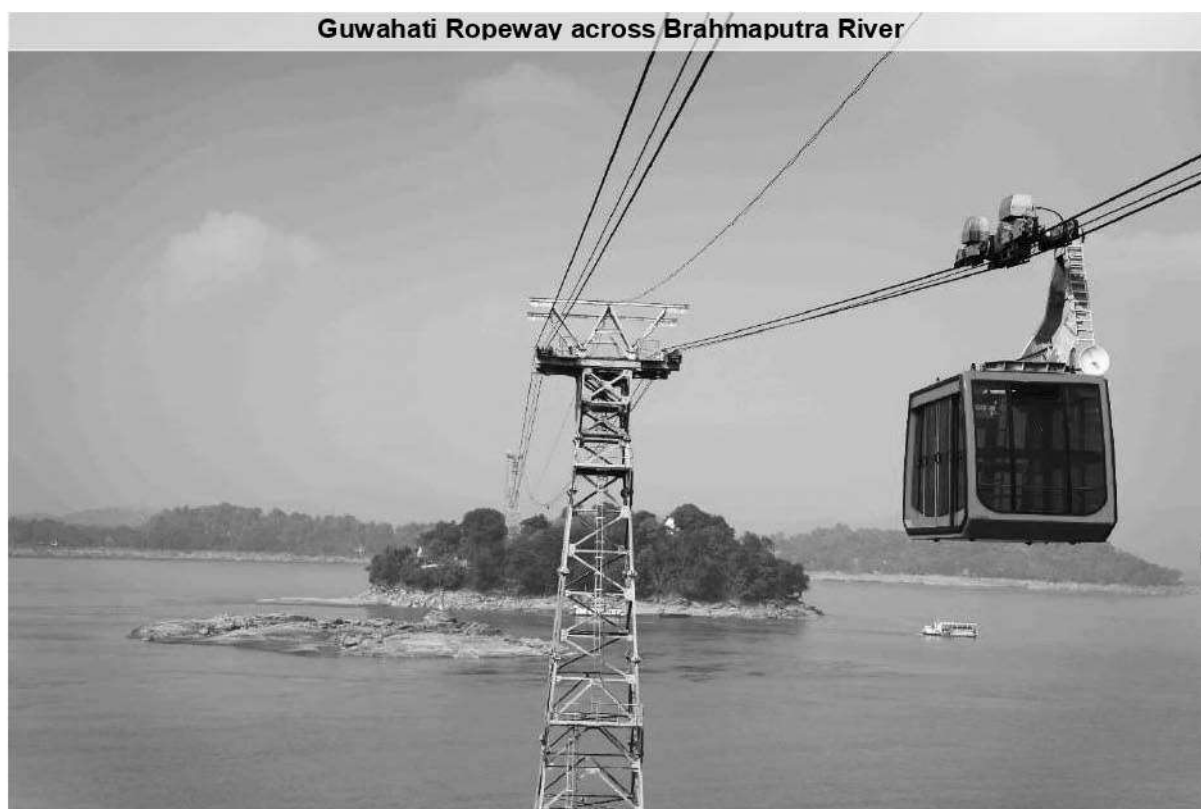
The Lokpriya Gopinath Bordoloi Airport also known as Guwahati Airport and formerly as 'Borjhar Airport', is the primary Airport of the North-east region of India. The airport

has undergone numerous expansions and renovations since its establishment in 1958. It handled more than 3.7 million passengers in 2017, an increase of 36% from 2016. The airport covers an area of 627.482 acres. Managed and operated by the Airport Authority of India, Guwahati airport is the major hub for flights to North-eastern states of India, with a capacity of handling more than 10 lakh passengers per year. The airport also currently serves as a base for the Indian Air Force.

5.2.2 Ropeway

The 1.8 km Twin-Track Bi-cable Jig Back cable car launched in Aug, 2020 across the Brahmaputra River connecting Guwahati -North Guwahati is the India's longest river ropeway. Initiated in year 2006, this 1800-metre-long ropeway is of immense value addition and believed 'another feather in the cap of the India's gateway to Northeast' in the promotion of tourism. It is acting as a connect between South to North Guwahati, giving the best scenic views above the river and is a great attraction for tourists.

The ropeway is not only boosting tourism but also reducing the travel time by 7.2 minutes for daily travellers from North-bank to South bank by ferry service. It is operated from Kacharighat south ghat of Pan bazar to the Dol Govinda north ghat of Brahmaputra River. It also gives beautiful view of the Umananda Temple on Peacock Island.



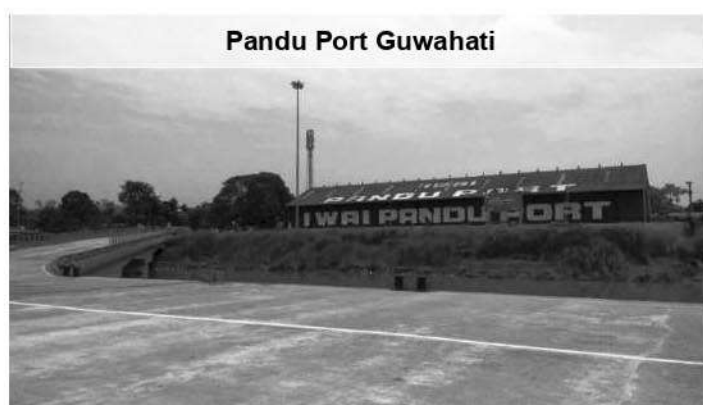
5.2.3 Railways

Guwahati is connected by Indian Railways network. There are several trains plying between Guwahati and other major cities of Assam and India. In the North-east frontier railway Guwahati and Maligaon is the headquarter. These headquarters are well connected to the Northeast state and with the major states of India like Delhi, Mumbai, Ahmedabad, Kanpur etc. Major trains are Dibrugarh Rajdhani Express, Agartala Rajdhani Express, Bangalore Humsafar Express, Naharlagun Shatabdi Express, Dibrugarh Shatabdi Express, Kolkata Garib Rath Express. To reduce the traffic on the Guwahati junction, there is another railway station in the city at Maligaon, the Kamakhya Railway station. Almost all newly introduced trains run from the Kamakhya Jn. railway station only. Guwahati railway station became the first railway station to run entirely on solar power. The Kamakhya railway station has upgraded its passenger amenities in recent past. The station is being developed jointly with the Union Ministry of Tourism. It has 10 retiring rooms with free Wi-Fi, television, air-conditioner etc. A dormitory containing 10 beds, waiting halls for 120 passengers to accommodate with the digital display system. It also comprises Rail wire free high-speed Wi-Fi service and computerized railway reservation system and vegetarian and non-vegetarian food stalls.

5.2.4 Maritime

In Guwahati there are 4 port including major and minor ports. Pandu port is one of them and it is the biggest port in Assam. Guwahati port consists of 108 vessel, and 56 terminal facility. There are 106 shipping yards.

The Pandu Port is an important terminal-cum-transit point for the goods and cargo destined for North-eastern Region. Recognizing the importance of Port and its centralized location, the Pandu Port has been developed as a multi modal inland terminal with permanent RCC jetties, a broad-gauge railway siding and road connectivity with NW-31. The Port is capable of handling all types of inland vessels including container vessels round the year.



The port has been working as the main river port of the Brahmaputra valley for a long-time centring Guwahati city. In the British India, jute and tea were transported from the port to Kolkata Port and Chittagong port.

The necessary goods were imported by the port on the same track. But after independence, this path was started till 1956. Pandu port acts as a natural river harbour. It falls under Dhubri-Sadiya National Waterway-2 and is an important terminal cum transit point for goods and cargo as well as passenger and tourist vessels. Construction of both low-level and high-level jetty of fixed terminal, capable of handling container vessels, has been completed and has further enhanced revenue generation for the city.

Table 5-4: Infrastructure Facilities at Pandu Port

Sr. No.	Infrastructural Features
1	Total Area of the terminal: 7 hectares
2	No. of Jetties: 2 (two) Permanent RCC Jetties
	High level jetty of size 50m x 20m berthing platform and 9m x20m approach
	Low level jetty of size 50m x 20m berthing platform and 115m x 8.5m approach
5	Transit covered Shed: 2 (two) of size 75m x 21m each
6	Weigh Bridge: 100T capacity
7	Shore crane: Two hydraulic shore crane of 20 MT and one crane of 75 MT capacity
8	Open storage area: 553.90 sqm

5.2.5 Roadway

The major road transport modes in Guwahati consists of Car and Taxi, Buses/Van, Autorickshaw/E-Rickshaw, Cycle rickshaws (also known as pedicabs or trishaws), Bicycle and Walking. A detailed bifurcation of the different modes and number of existing vehicles in Guwahati are shown in the upcoming section.

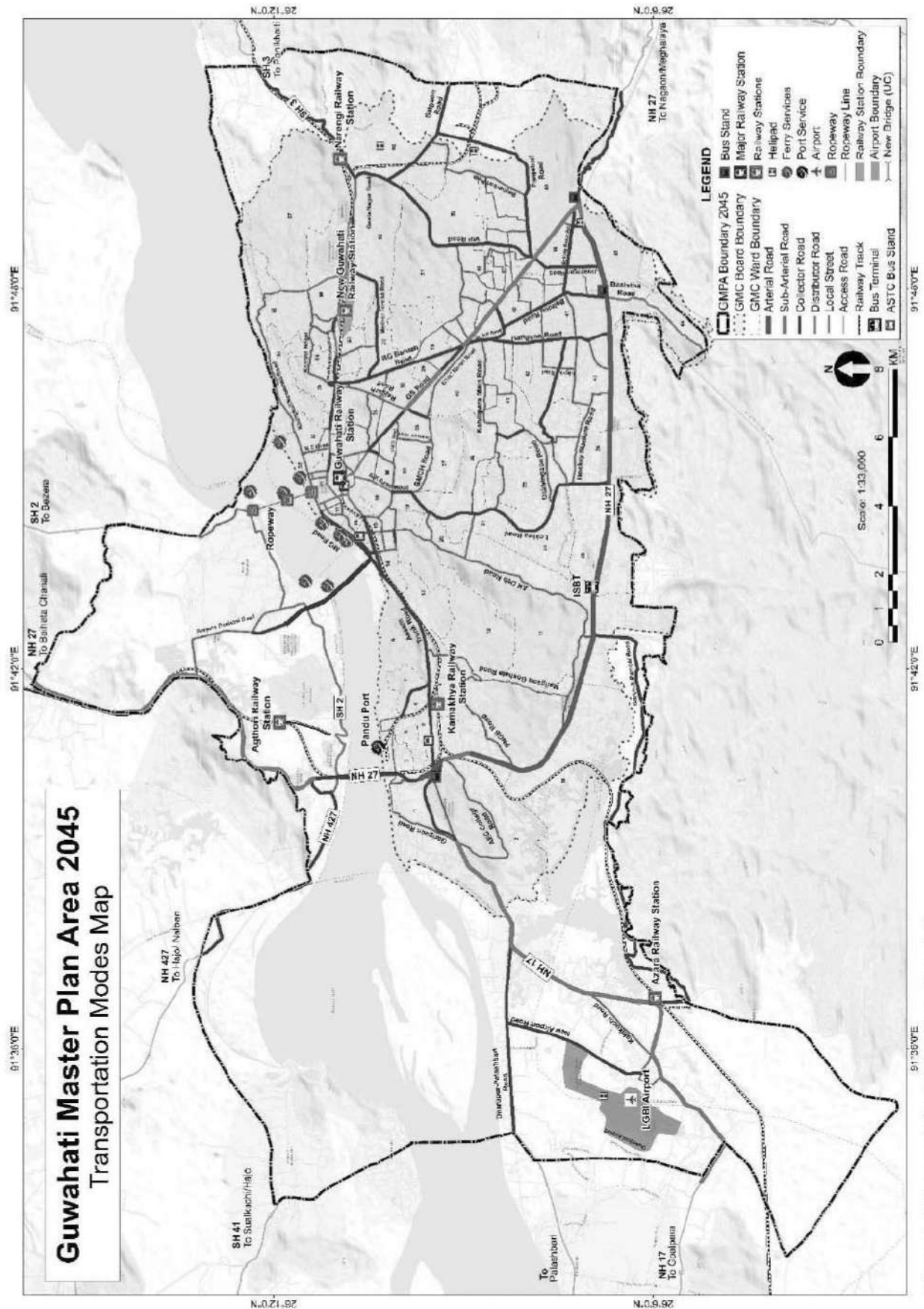


Figure 5-4 Transportation Modes Map, Guwahati

5.3 Existing Road Network

To understand the demand-supply gap and accordingly to assess the improvement requirements of the study area a detail analysis of existing transport facility characteristics is necessary. As existing traffic and travel characteristics introduces the transport system demand, existing transport facility characteristics summarize the system supply. Appreciation of road network characteristics is important to assess existing capacity of the roads, identify the constraints, if any, and assess the potential for improvement/up gradation of the road network to cater the existing and projected traffic demand. For the present study, a detailed inventory of major road network has been carried out. The road network inventory data was analysed in terms of parameters like function of road, length of road, carriageway, width of footpath / shoulder, no. of lanes etc.

5.3.1 Primary Road Network

Guwahati is mainly connected to other important destinations by SH-41, SH-2 and SH-3 which connects Guwahati to neighbour towns like Hazo, Bezera, Panikhaiti, Mayang and Morigaon. NH 17, NH 27 and NH 427 are passes through Guwahati and connects it to other parts of India and Assam. Major states connected with Guwahati by NH 27 across India are North & West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat. Many other towns of Assam connected to Guwahati by NHs are Barpeta, Jorhat, Sivasagar, Nalbari, Dibrugarh and Silchar. NH-427 starting from its junction with NH-27 near Howli connecting Barpeta, Hajo, Goalpara, Dhubri and terminating at its junction with NH 27 near Jalukbari in Guwahati. Moreover, Guwahati is also well connected with West Bengal by NH 17 starting from its junction with NH-10 near Sivok connecting Bagrakot, Chalsa, Nagarkata, Goyerkata, Birpara, Falakata, Sonarpur, Koch-Bihar, Tufanganj in the State of West Bengal, Golakganj, Bilasipara-North Salmara, Goalpara, Boko and entering from the Bijohnagar in Guwahati connects it with Lokpriya Gopinath Bordoloi Airport and terminating at its junction with NH-27 near Guwahati in the State of Assam. NH-37 Starts from Silamkhatai and ends at 9th mile area in South-East of Guwahati. NH-37 passes through whole Guwahati city from South, connecting 2 major junctions of Guwahati city i.e. Jalukbari and Khanapara. All State highways enter from the North of Guwahati city. SH-41 enters from Singimari and connects Guwahati with Nalbari, Barpeta, Goalpara and rest of the Assam. SH-2 starts from Dhakin Fulung and connects Guwahati City with Nagaon,

Tezpur, Meghalaya and other States and cities from East side. SH-3 enters at Panikhaiti in GMPA and connects with Morigaon, Nagaon and other cities of Assams.

5.3.2 Secondary Road Network

Guwahati Urban Area is connected to its adjoining regions mainly via nine **Major City Road**. They are:

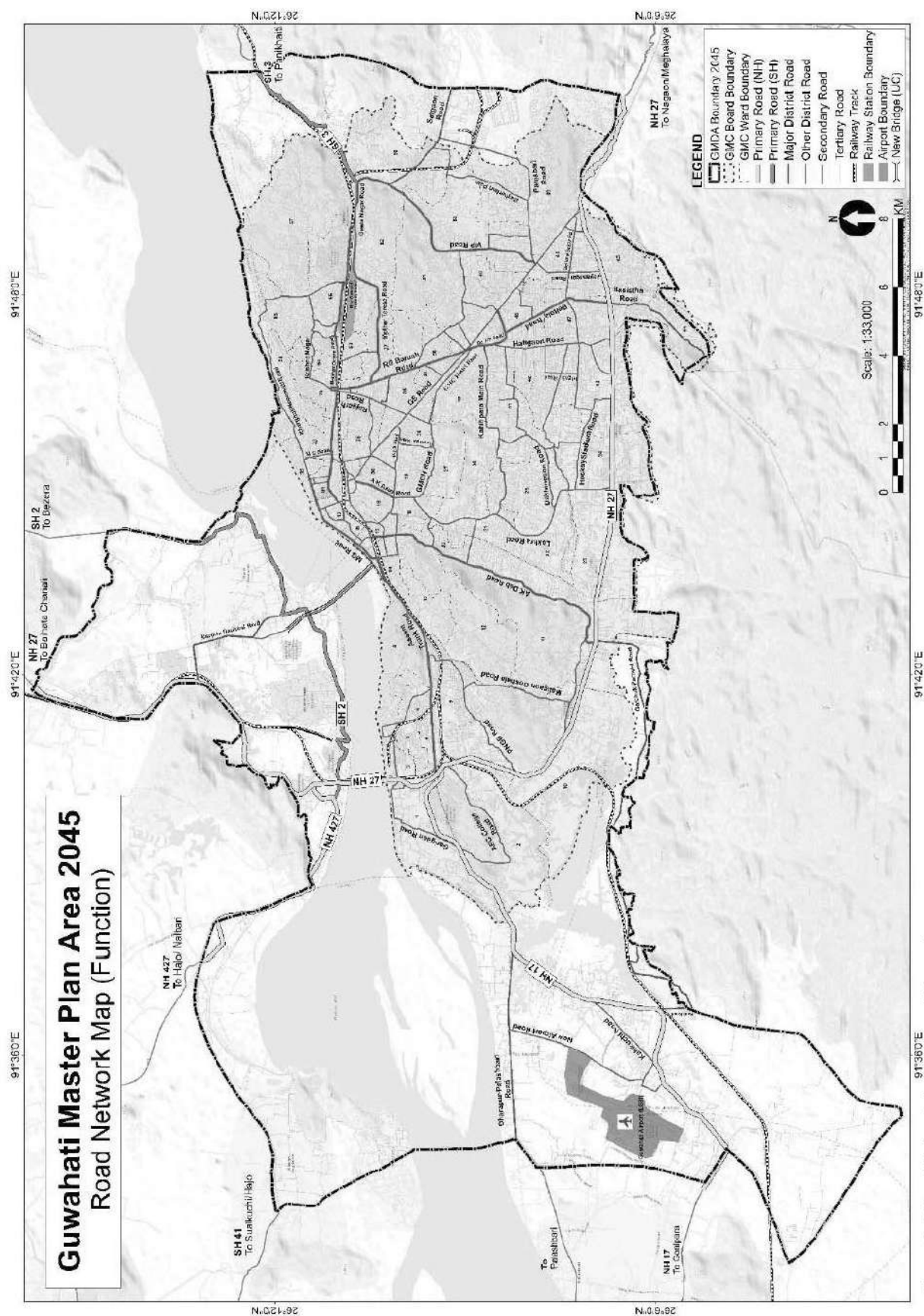
1. AT Road
2. Beltola Road
3. GS Road
4. MG Road
5. Guwahati Club to Ulubari
6. Dr. BK Kakati Road
7. Mahapurush Madhabdev Path
8. Gorchuk - Fatasil Road
9. GMCH Road
10. Zoo Road
11. Maniram Dewan Road
12. Lokhra Road
13. Paltan Bazar Road

5.3.3 Tertiary Road Network

The tertiary road network consists of all the city roads and village roads and link roads which connect the rest of the settlements in the Planning Area. These roads connect the settlements along various contours and hilly undulating terrain

But the road network in the town can be described as poor, not in terms of linkages but maintenance. There are regular bus and sumo services connecting Guwahati by road with Tezpur, Nagaon, Dibrugarh and other parts of the Assam.

Guwahati district is relatively well placed in road infrastructure as compared to another district of Assam. As the Guwahati district is situated in the east part of Assam the town is also well connected by roads linking with all the major towns of Assam. The National Highway 37 and 17 passes through the town. The radial roads are primarily the major roads which connect the regions and the other important towns with Guwahati.



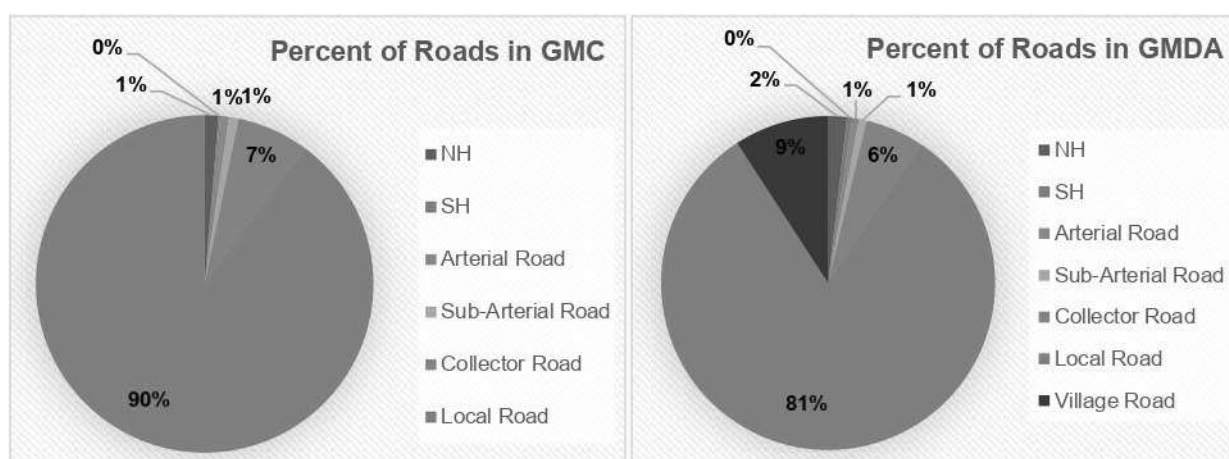


Figure 5-6 Hierarchical Road coverage within GMC and GMDA

Table 5-5 Hierarchical Road length in GMDA

Sl. No.	Urban Roads	Road Length (km) in GMDA	Road Length (km) in GMC
1	NH	63.4	35.0
2	SH	18.7	4.5
3	Arterial Road	22.4	22.4
4	Sub-Arterial Road	26.4	25.0
5	Collector Road	198.8	184.9
6	Local Road	2854.6	2403.8
7	Village Road	321.6	0.0

(Source: Compiled by Consultants)

5.4 Road Inventory

In terms of distribution of roads widths, excluding local level roads (9 m road width), the city is well placed with about 24% of its width exceeding 30 meters and above; about 28% of the network is wider than 18 meters. It is important to note that many of these roads form a part of NH/SH network. Within the developed area, road densities are about 12 km/sq.km. (Sources: SLB for Indian Cities, 2016)

The area under roads (area of 88 sq. km) is about 26% of the total area of the SMC limits. With reference to the map given below, it is observed that not all roads are developed to their full widths. This is of concern as inconsistency in road widths along major corridors leads to congestion and bottleneck at junctions.

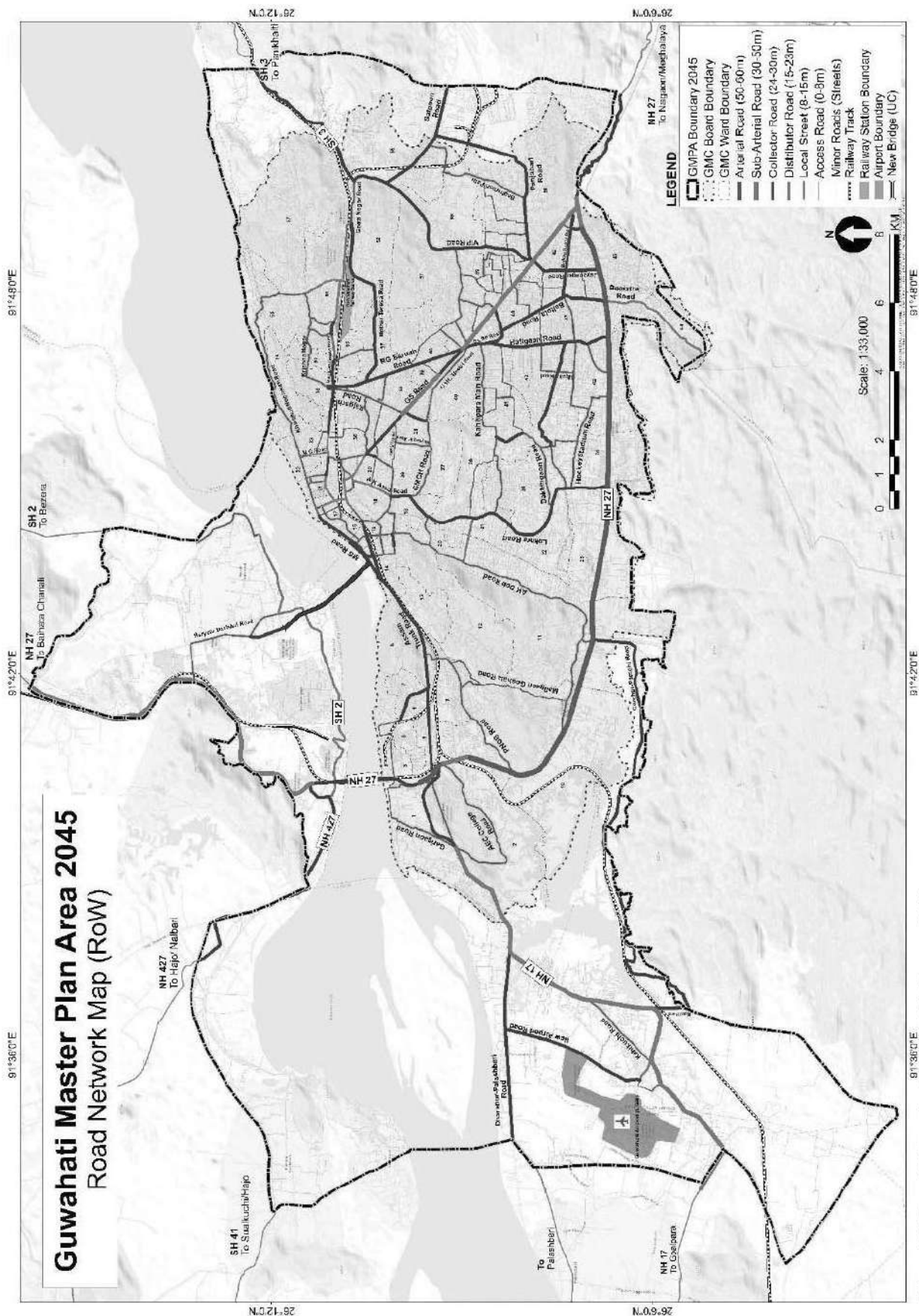


Figure 5-7 Road Network of Guwahati MP area 2045

5.4.1 Road Hierarchy

Road network of a city gives idea of the hierarchy of roads present in the city. The hierarchy of city is based on different widths of the roads. It also tells that which road perform which type of function like arterial road, sub-arterial road, collector streets or access roads. It is important to identify higher hierarchy roads as they are major transit corridors of any city. Road inventory is depicted in the Figure 5-7 which includes all the highways, major roads, minor roads, private/public roads, village roads etc. The whole network shows the road connectivity in the city.

The highways which pass through the Planning Area connects Guwahati to nearby cities. Except Highways and few other roads, majority of the roads in the Planning area are having a carriage way of 14 mt. For example, the roads running across key commercial areas such as G.S road, Zoo Road, NH-37 (Jalukbari to Khanapara), Jalukbari to Bharalumukh are too congested, and this leads to increased travel time within the city and deterioration in quality of life in these important nodes of the planning area.

Table 5-6 Hierarchical Road length coverage within GMC & GMDA

Sl. No.	Urban Roads	Road Length (km) in GMDA	Road Length (km) in GMC
1	National Highway	63.4	35.0
2	State Highway	18.7	4.5
3	Arterial Road	22.4	22.4
4	Sub-Arterial Road	26.4	25.0
5	Collector Road	198.8	184.9
6	Local Road	2854.6	2403.8
7	Village Road	321.6	0.0

(Source: Compiled by Consultants)

The roads in the Planning area are shown in Figure 5-7 in different categories with respect to their RoW. The RoW in the planning area varies from 6 mt to 45 mt. It can be observed from the fig 63 that some of the important roads such as NH-37 do not have a uniform right of way and carriage way.

In Assam, NH-37 has a right of way of 15 mt, however, in Guwahati NH-37 enters in Bahaita from North by carrying the width of road as 24 mt., in addition by intersecting NH-427 at Amingaon, it further connects Guwahati with Bahaita, Sipjhar, Rangai and other major towns of Assam. NH-427 enters in GMPA at Singimari with width of 15 mt. and connects Guwahati to Hajo and Barpeta.

The NH-17 starts from Jamduar in Assam which enters in GMPA at Chhaygaon with width of 12 mt. It connects Guwahati to Goalpara and other nearby towns in Assam. This NH-17 also known as airport road as it connects the city with Borjhar airport. The NH-37 have many punctures towards city which is not in hierarchy with it, like Gorchuk-Fatasil and Lokhra Road is 15mt directly intersecting at 45 mt. of NH-35. The Hatigaon-Bethapara road is 24mt. which is also intersecting directly at NH-37.

5.4.1.1 National Highway (NH)

National Highways passing through the Guwahati Planning Area along with its length, width and number of lanes are presented in Table 5-7. NH-37 enters from North at Silamkhataiy further meets at Jalukbari and heads towards Khanapara in East through Lokhra junction. Another is the NH-17, known as Airport Road going towards Borjhar and further western part of Assam.

Table 5-7 List of National Highways passing through Guwahati planning area

Sl no.	Name & route of the road (NH)	Type of road	Length of the Road (km)	R.O.W (m)	C.W. (m)	Median (m)	No. of lanes
1.	Bongara to Kahikuchi	NH 17	2.50	12	7	-	-
2.	Rani to Kalitakuch (VIP Airport Road)	NH 17	1.00	40	28	2	2
3.	Jalukbari to Rani	NH 17 (Bypass)	11.50	28	14	2	2
4.	Jalukbari to Lankeshwar	NH 17	2.00	15	7	1	2
5.	Amingaon to Hajo	NH 427	8.00	20	12	2	2
6.	Amingaon towards Rangia	NH 27	11.50	24	12	2	-
7.	Saraighat Bridge	NH 27	1.39	11	10.5	-	3
8.	Jalukbari To Saraighat Bridge	NH 27	1.50	40	28	2	2
9.	Khanapara to Jalukbari	NH 27	17.50	60	16	14	2
10.	Khanapara towards Jagiroad	NH 27	4.50	25	14	2	2

(Source: Compiled by Consultants)





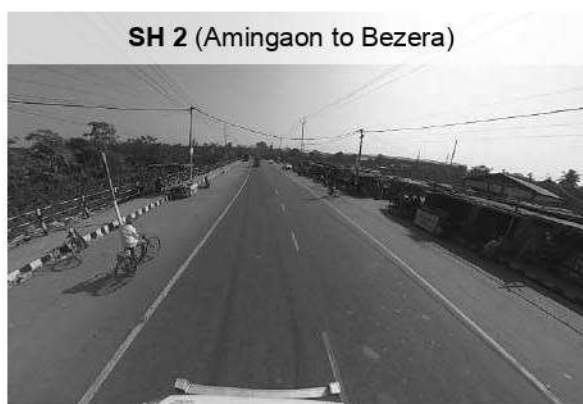
5.4.1.2 State Highway (SH)

The Table 5-8 describes the State Highway passing through Guwahati Planning area with parameters like width of carriage way, its length and number of lanes. The SH-41 and SH-2 join at Amingaon in GMPA from north. SH-41 connects to Barpeta and Goalpara while SH-2 connects with Bezera, Silapahar and other towns of Assam from. SH-3 enters at Narengi junction from Panikhaiti in the east. It connects Guwahati with Morigaon, Nagaon and cities of Assam.

Table 5-8 List of State Highway passing through Guwahati planning area

Sr. No.	Name of the road (SH)	Type of road	Length of Road (km)	R.O.W (m)	C.W. (m)	Median (m)	No. of lanes
1.	Amingaon to North Guwahati	SH 2	14.20	18	6	-	2
2.	Narengi to Morigaon	SH 3	4.50	25	14	2	4
3.	Dadara hajo to Amingaon	SH 41	6	12	7	2.5	2

(Source: Compiled by Consultants)



5.4.1.3 Major Link Roads (Major District / Other District Road)

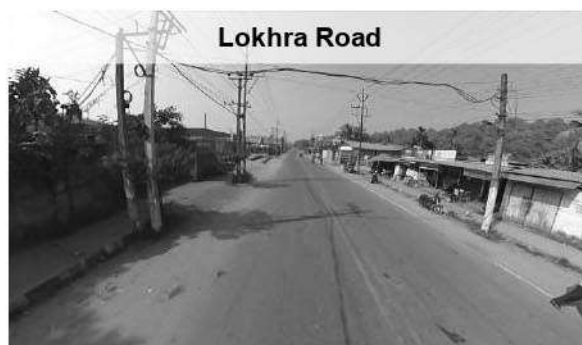
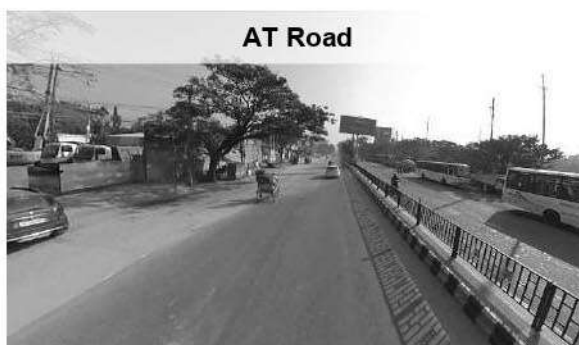
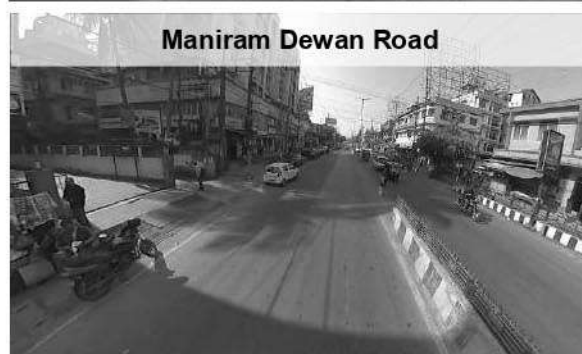
The district roads are the means to serve and connect all the areas in the city and to villages. As per IRC, the roads which are having road width greater than 10 m are counted as Major roads. Following are the roads which fall under this category as per IRC guideline.

Table 5-9 List of Primary roads of Guwahati MP area

SI no.	Name of the Roads (Major Roads)	Route	Length of Road (km)	R.O.W (m)	C.W. (m)	No. of Lanes	Median (m)	Foot path (m)
1	G S Road	Khanapara to Paltan Bazar Bus Stop	9.70	30	14	4	2	2
		Paltan Bazar Bus Stop to Paltan Bazar Police Station	0.23	22	12	4	2	2
2	A. T. Road	Paltanbazar Police Station to Bharalumukh Traffic Signal	2.23	20	14	4	1	1.5
		Bharalumukh Traffic Signal to Maligaon	1.29	24	12	4	2	3
		Maligaon to Jalukbari Flyover	2.30	30	12	4	2	2
3	R G B Road	Ganeshguri to Chandmari Flyover	4.33	24	14	4	2	2
4	V I P Road	Sixmile Flyover to Narengi Tiniali	6.28	30	14	4	5	2
5	Dr. B Barooah Road	Ulubari Flyover to Guwahati Club	1.16	12	6	2	-	2
6	GMCH Road	Ganeshguri to GMC Auditorium	2.39	10	6	2	-	1.5
		Rupnagar L P School to Birubari Tiniali Chowk	2.40	12	6	2	-	1.5
		Bhangaghar Flyover to Rupnagar L P School	0.65	30	14	4	5	2
7	Beltola Bazaar Road	Khanapara Veterinary to Beltola tiniali	2.25	24	14	4	2	2
8	Lokhra Road	Kalapahar to Birubari Tiniali	2.15	18	6	2	1	2.5
		Lokhra Chariali to kalapahar	3.83	20	7	2	-	2
9	Dr. B K Kakati Road	Ulubari Flyover to A S E B Road	0.81	15	6	2	-	3
		A S E B Road to Sarabhathi Chowk	0.75	12	6	2	-	1.5
10	Maniram Dewan Road	Noonmati Flyover to Guwahati Refinery Mural	1.67	20	7	2	2	2
		Guwahati Refinery Mural to Chandmari Flyover	2.91	15	7	2	-	2
		Chandmari Flyover to Guwahati Club	1.81	18	7	2	1	2

11	A K Dev Road	Garchuk Charali to Kumarpar	7.24	15	7	2	-	2
12	A K Azad Road	Birubari Tiniali to Nepali Mandir	7.24	18	6	2	-	2
13	M G Road	Bharalumukh Traffic Signal to Sukreshwar Devalay	1.97	24	14	4	1	2
		Sukreshwar Devalay to Guwahati Planetarium	1.05	16	6	2	-	2
14	A S E B Road	Dr. B K Kakati Road to ABC	1.20	12	6	2	-	1.5

(Source: Compiled by Consultants)

**Beltola Road****G.S. Road****Lokhra Road****AT Road****Maniram Dewan Road****M.G. Road****R G B Road****GMCH Road**

5.4.1.4 Collector Roads

Being a Hill city, surrounded by Hills and Hillocks, the important roads in Guwahati Municipal area are conceived by major arterial roads which are connected by a peripheral radial road. All road networks including street road, village road and other roads are counted as collector roads. These are listed in Table 5-10 along with their width of carriage ways.

The Guwahati Shillong Road i.e., GS road on South bank of Brahmaputra is the most important corridor stretching 11km from the city centre to Khanapara southward. Dispur, the capital complex since 1972, is situated on this stretch, as is Ganeshguri, a major market. With passage of time number of commercial spaces emerged out along the road and the stretch became a major commercial corridor of the City.

The other major city roads running within town are MG Road, Jail Road, HB Road, GNB Road, SS Road from the Fancy Bazar, Pan Bazar and Uzan Bazar and connecting the CBD area to Chandmari, Bamunimaidan and Narengi on East. This stretch is majorly developed with commercial markets, major Public and Semi-public buildings and few recreational spaces.

On perusal of the existing road network of Guwahati City it is observed that some of the important roads identified are not uniform in their width and some stretches needs widening to reduce congestion and ease traffic movement. On a perusal of the existing road network, it is observed that the core city area requires widening and proper linking to form ideal radial ring roads diverged with optional arterial rods to decongest the core city centre area.



Figure 5-8 Road Network of municipal areas of Guwahati and North Guwahati

The following are the list of other district roads / Collector roads which pass through the Guwahati urban area.

Table 5-10 List of tertiary roads within GMPA

Sl. No.	Name of the Road	Route	Length (km)	R.O.W (mt)	C.W. (mt)	No. of Lanes	Footpath (mt)
1	VIP Airport Road	VIP Chowk to New Airport Road	0.70	16	8	2	2
2	Vidyamandir Path	Beharbari to Bhetapara	1.10	12	6	2	1.5
3	Jayanagar Road	Patorkuchi to Jayanagar Chariali	1.00	24	12	4	2
	Jayanagar Road	Jayanagar Chariali to Sixmile Flyover	1.05	20	12	4	2
4	Tayabulla Road	Lataasil to Digholi Pukhuri	0.58	15	7	2	2
5	Swahid Dilip Hujuri Path	Dispur Super Market to Hengrabari	1.18	10	6	2	1.5
6	Sijubari-Notbama Road	Hatigao Chariali to Notbama	2.17	15	7	2	2
7	Sati Joymati Road	Sarabhati Chowk to Athgaon	2.18	16	7	2	2
8	Satgaon Road	Pathar Quarry to Satgaon Post Office	3.30	25	7	2	2
9	S Sarania Road	Ulubari Flyover to Rajgarh	1.63	12	6	2	1.5
10	S C Road	Kumarpar Pachali to Athgaon	0.44	12	6	2	2
11	Rukmini Path	G S Road to Rukmini Gaon	0.53	12	6	2	2
12	Roop Kumar Link Road	Sachal to Bormotoria	1.38	12	6	2	2
13	Rani Road	Rani Bazar to Accoland	1.03	10	6	2	-
14	Rangamansa Path	Baali Baat to Rukmini Nagar	0.29	10	6	2	1
15	Rajgarh Road	Bhangaghar to Sarania Hills	2.06	15	7	2	2
16	Rajgarh Link Road	Rajgarh to AIDC	1.04	12	6	2	2
17	R K C Road	Bharalumukh Traffic Signal to Santipur	0.61	15	6	2	2
18	Pub Jyotinagar Road	Jyotinagar to Kalpabhatta Chowk	1.10	12	6	2	2
19	Panjabari Road	Sixmile Flyover to Satgaon	5.33	24	14	4	2
20	Pandu Port Road	Ferry ghat, Adabari to Maligaon	4.04	15	7	2	1.5
21	New Airport Road	Airport New Market to Dharapur-Palashbari Road	4.20	12	7	2	-

22	N S Road	Santipur to Athgaon	1.30	15	6	2	2
23	Mother Teresa Road	Zoo Road Tiniali to Noonmati Flyover	4.69	24	12	4	2.5
24	M C Road	Guwahati Club to Uzanbazar	0.82	10	6	2	1.5
25	MD Shah Road	A T Road to G S Road via Nepali Mandir	0.54	15	7	2	2
26	Manipuri E Road	G S Road to K C Sen Road	0.30	12	6	2	2
27	Maligaon Road	Tetelia to NF Railway Headquater	4.63	10	6	2	1.5
28	M L N Road	Lakhtokia to Athgaon	0.32	24	14	4	2
	M L N Road	Panbazar Pani Tanki to Lakhtokia	0.61	12	6	2	2
29	Lalganesh Road	Lokhra Chariali to Sawkuchi Tiniali	1.07	20	7	2	2.5
30	Kula Basumatary Path	Dhirenpara to Kalapahar	1.20	15	6	2	2
31	Krishna Nagar	Chandmari Flyover to Jyotinagar	2.02	12	6	2	2
32	Kharghuli Noonmati Road	Guwahati Planetarium to Guwahati Refinery Mural	7.80	15	6	2	2.5
33	Kanaklata Road	Dakhingaon Bridge to Sijubari	2.23	12	6	2	3
34	Kahlipara Road	M L A Hostel to Lalganesh	5.12	12	6	2	2
35	Kahikuchi Road	Azara Police Station to VIP Chowk	2.77	10	7	2	-
36	K R C Road	Kumarpar Pachali to Bharalumukh	0.52	12	6	2	2
37	K C Sen Road	Paltan Bazar to Gandhi Basti	0.55	12	6	2	2
38	Jyotinagar Road	Jyotinagar , Bamunimaidam	0.65	10	6	2	1.5
39	Jatia Swahid Path	Vetenary Field to G S Road	0.62	15	7	2	2
40	Japorigog Road	Nayanpur Tiniali to Assam State Zoo	1.35	12	6	2	2
41	Idgah Road	Ghoramara to Sijubari	1.00	12	5	2	2
42	Hockey Stadium Road	Bhetapara Chariali to Sawkuchi Tiniali	4.43	12	6	2	2
43	Hengrabari Road	Borbari Chariali to Hengrabari	2.78	12	6	2	1.5
44	Hatigarh Main Road	Hatigarh Chariali to Bamunimaidam	1.23	10	6	2	1.5
45	Hatigaon Road	Bhetapara Chariali to Hatigaon Rajdhani Masjid	2.50	20	12	4	2

46	Hatigaon Bhetapara Road	Lalmati to Bhetapara Chariali	1.03	20	12	4	2
47	Rupnagar Road	Rupnagar to Ulubari	1.03	10	6	2	2
48	H B Road	Machkowa Masjid to Panbzar	1.60	12	6	2	2
49	Geeta Nagar Road	Noonmati Flyover to Narengi Tiniali	1.14	24	12	2	2.5
50	G N B Road	Fancy Bazar to Lakhtokia	0.52	15	6	2	2
	G N B Road	Lakhtokia to Guwahati Club	1.26	20	12	4	2
51	F A Road	Machkowa to Kumarpara	1.14	12	6	2	2
52	Fatick Chandra Road	Judges Field to Latasil	0.15	16	7	2	2.5
53	Fatasil Ambari Road	Fatasil Ambari to Kalapahar	0.82	12	6	2	2
54	Embankment Road	Lokhra to Dakhingaon Bridge	1.27	20	9	2	3.5
55	Dr. Zakir Hussain Road	Downtown to Nabajyoti Club	1.55	10	6	2	1.5
56	Dr. R P Road	Dispur Super Market to Secretariat Circle	0.62	34	14	4	2.5
	Dr. R P Road	Secretariat Circle to Ganeshguri	1.38	20	12	4	2
57	Dr. Bhupen Hazarika Path	Bamunimaidam to Jyotinagar	0.77	10	6	2	2
58	Dr. Bapender Nath Path	Beltola Tiniali to Secretariat Circle	2.00	20	14	4	2
59	Digholi Pukhuri Road	Latasil to G N B Road	0.50	15	7	2	2
60	Dharapur Palashbari Road	Dharapur to Garal	5.02	12	7	2	-
61	Dekapara Road	Borjhar to Dekapara	0.92	10	7	2	-
62	Deeporbil Road	Garchuk Chariali to Rani	13.15	12	6	2	-
63	Dakhingaon Road	Lokhra Road to Dakhingaon Tiniali	2.32	15	7	2	1.5
	Dakhingaon Road	Dakhingaon Tiniali to Odalbakra	0.84	20	12	4	2
64	Dakhin Bangaon Road	Hockey Stadium Road to Dakhingaon	1.23	10	5	2	2
65	Chachala Road	Sixmile Flyover to Bormotoria	0.71	12	6	2	2
66	Bishnu Rabha Path	Beltola Tiniali to Bhetapara Chariali	1.24	10	6	2	1.5
67	Basistha Road	Basistha Chariali to Borpathar	4.68	20	12	4	2

68	Balibat Path	Rukmini Gaon	0.35	10	6	2	1
69	Bagherbari Path	Bagherbari Tiniali to Satgaon	3.67	12	6	2	1.5
70	A K Dev Road	Garchuk Charali to Kumarpur	7.24	15	7	2	2
71	A K Azad Road	Birubari Tiniali to Nepali Mandir	1.74	18	6	2	2
72	A E C Road	Jalukbari to Satmile	5.08	12	6	2	1.5
73	A G Colony Road	Beharbari to Kerakuchi	0.89	10	5	2	1.5
74	Dr. Nirmal Prabha Road	Lichubagan to Nayanpur	0.48	12	6	2	1.5
75	Nayanpur Road	Ganeshguri to Nayanpur Tiniali	0.81	12	6	2	2
76	F A Ahmed Road	Panjabari Road to Radhanagar Path	1.00	10	6	2	1.5
77	Paschim Boragaon Road	Paschim Boragaon to Garchuk	2.70	15	7	2	2

(Source: Compiled by Consultants)

5.5 Vehicular Population and Growth Trend

Vehicle registration is essential to establish link between a vehicle and an owner or user of the vehicle. In the Table 5-11 given below, categories of public and private vehicles along with their number is mentioned. The information has been provided by the District Transport Office, Guwahati. The categorization has been done based on transport and non-transport use. Further in Table 5-13, the number of vehicles is depicted in LMV (light motor vehicles) and HMV (heavy motor vehicles).

Table 5-11 No. of Vehicular registration in Planning Area

Vehicle Class	Vehicle Registrations				
Transport	9338	14330	10424	8041	6437
	2016-17	2017-18	2018-19	2019-20	2020-21
Tractor-Trolley(Commercial)	1	0	0	0	0
Mobile Workshop	4	0	2	3	2
Maxi Cab	1406	52	78	27	11
Motor Cab	1376	2210	1406	464	225
Bus	531	538	492	229	129
Ambulance	104	261	54	38	185
Cash Van	5	32	19	72	40
Fire Fighting Vehicle	1	15	29	8	40
Hearses	3	4	1	1	2
Dumper	421	445	431	331	298
Excavator (Commercial)	98	222	414	441	209
Trailer (Commercial)	10	1454	690	87	0
e-Rickshaw(P)	901	276	0	0	0
Three Wheeler (Passenger)	102	545	598	254	216
Three Wheeler (Goods)	1378	1687	1507	720	649
Goods Carrier	2903	4168	4171	3742	3986
Tractor (Commercial)	94	2343	493	1611	424
Mobile Clinic	0	1	1	6	1
Omni Bus	0	0	1	0	0
Articulated Vehicle	0	19	19	0	15
Camper Van/ Trailer	0	22	18	3	3
Mobile Canteen	0	1	0	4	2
Fire tenders	0	35	0	0	0
Non-Transport	80608	84454	84679	64482	61003
	2017	2018	2019	2020	2021
M-Cycle/Scooter0With Side Car	2	11	6	8	11
Moped	141	119	70	33	53
Adapted Vehicle	0	0	0	1	2
Motorised Cycle (CC > 25cc)	1	0	0	0	4
Three-Wheeler (Personal)	4	9	1	1	1
Motor Car	27767	26266	25676	22077	21916
Vehicle Fitted with Rig	1	0	1	1	0

Vehicle Fitted With Compressor	2	1	2	0	0
Recovery Vehicle	1	0	0	0	0
Construction Equipment Vehicle	75	29	29	39	44
Crane Mounted Vehicle	0	21	39	37	49
Excavator (NT)	23	0	0	13	73
M-Cycle/Scooter	52591	57998	58852	39932	37801
Omni Bus (Private use)	0	0	1	1	0
Agricultural Tractor	0	0	2	1220	1014
Trailer (Agricultural)	0	0	0	1111	35
Earth Moving Equipment	0	0	0	8	0

(Source: DTO, Guwahati)

5.5.1 Growth Trend of Vehicular Population & Its Composition

Table 5-12 Vehicular registration growth rate by (2017-2021)

Vehicle Registration		
Year	Count (Thousand)	% of Growth
2017	89.95	-
2018	98.78	9.83%
2019	95.10	3.73%
2020	72.52	23.74%
2021	67.44	

(Source: Consultant Compilation)

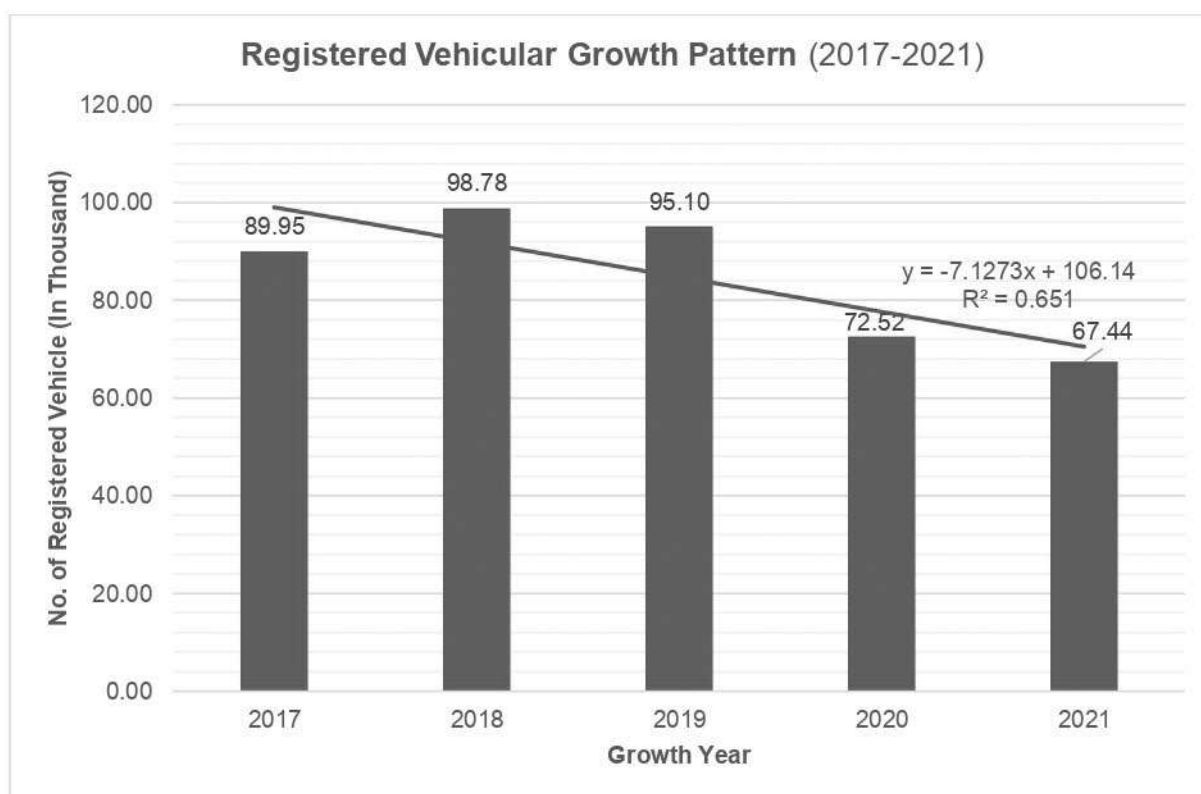


Figure 5-9 Vehicular growth trend in planning area (2017-2021)

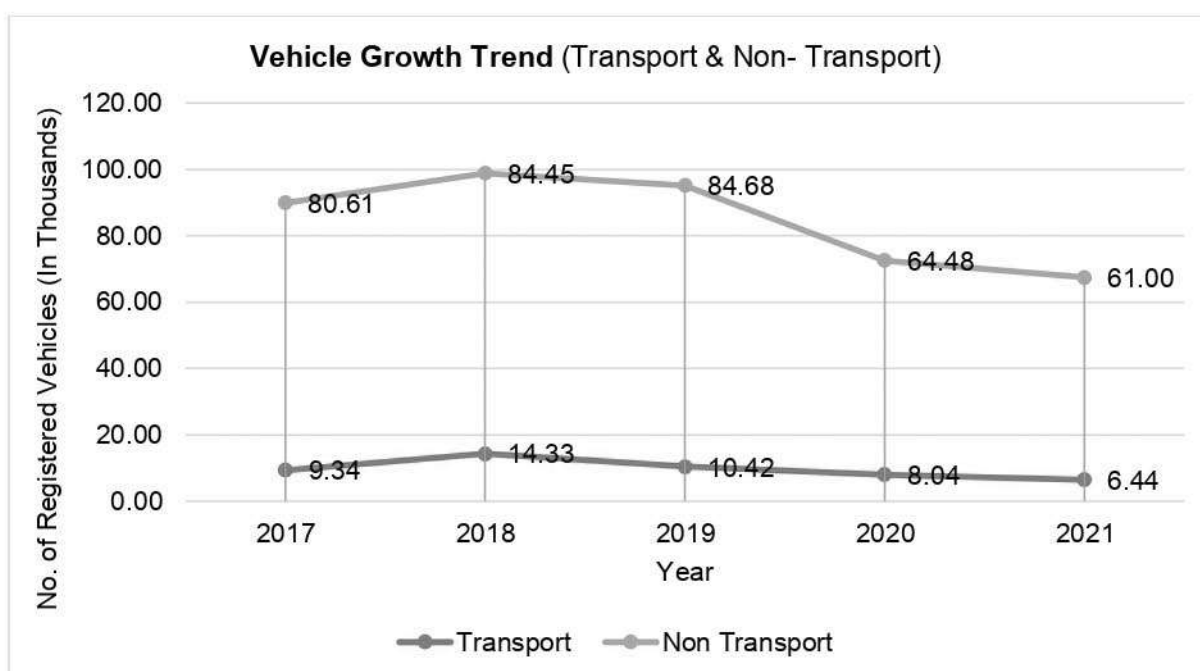


Figure 5-10 Vehicular growth trend in planning area (Transport & Non-transport, 2017-2021)

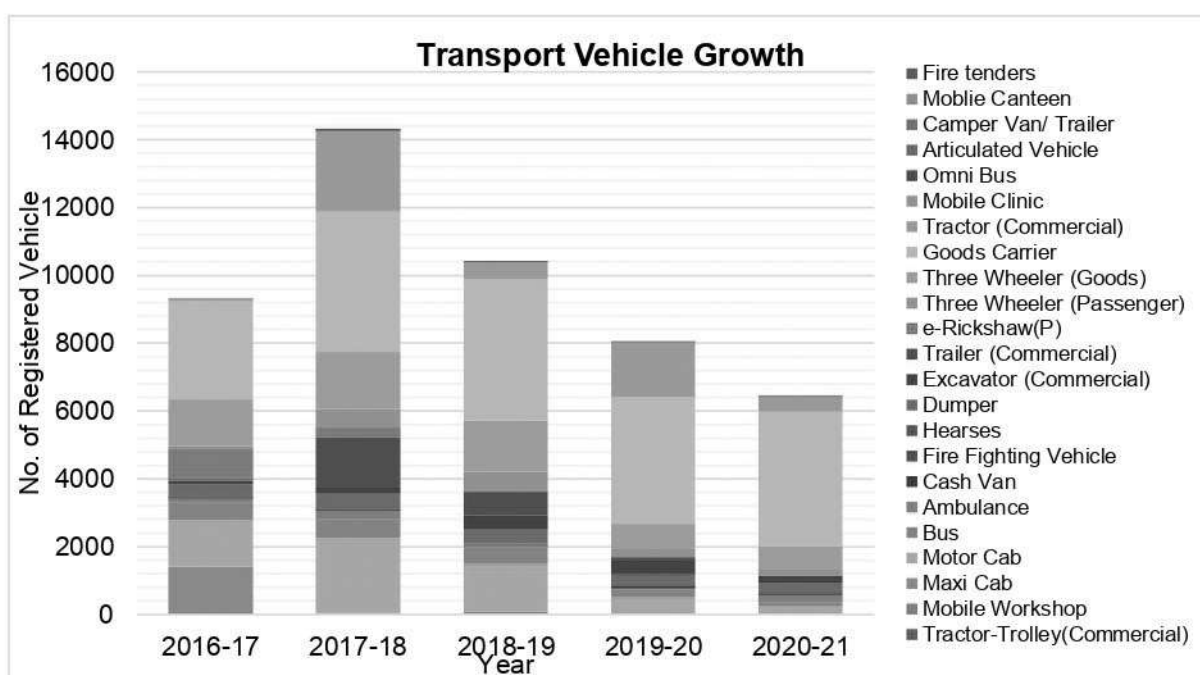


Figure 5-11 Transport vehicular growth by category (2017-2021)

Figure 5-9 shows that the growth in the gross vehicular registration has steadily increased from 2017 to 2018 and after that it is decreasing steadily. This is attributed to the change in policy and critical drop of economy due to Global Covid pandemic outbreak. It can be also inferred from Figure 5-11 that the Transport vehicles registration have observed steady decrease in lower side compared to the high decrease in Non-transport vehicles after 2018.

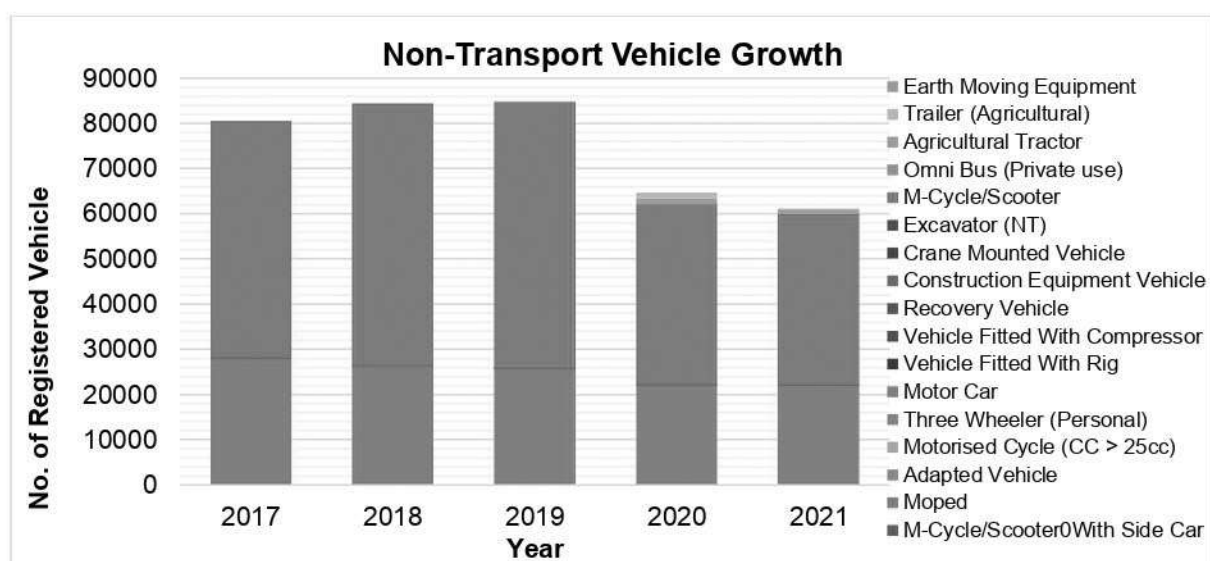


Figure 5-12 Non-Transport vehicular growth by category (2017-2021)

In Guwahati Region, the category of vehicles registered with regional transport office are analysed, grouped as six different categories and are presented in the Table 5-13.

Table 5-13 Major Category of Vehicles registered in Guwahati

Vehicle Category					
Major Category of Vehicles	2017	2018	2019	2020	2021
Heavy Transport Vehicle					
Heavy Goods Vehicle	1534	2165	1971	990	1114
Heavy Motor Vehicle	68	39	24	17	1
Heavy Passenger Vehicle	358	291	323	167	91
Light Transport Vehicle					
Light Goods Vehicle	1883	6273	3820	4754	3599
Light Motor Vehicle	27767	26267	25679	24401	22968
Light Passenger Vehicle	2882	2553	1564	559	423
Medium Transport Vehicle					
Medium Goods Vehicle	130	320	494	521	311
Medium Motor Vehicle	2	7	16	21	4
Medium Passenger Vehicle	170	220	144	31	33
Other than mentioned above	34	4	34	114	159
Three-Wheeler					
Three-wheeler(nt)	4	9	1	1	1
Three-wheeler(t)	2381	2508	2105	974	865
Two-Wheeler					
Two-wheeler (nt)	52733	58128	58928	39973	37869
LMV Non- Transport					
Four-Wheeler (Invalid Carriage)	0	0	0	1	2

(Source: Consultant Compilation)

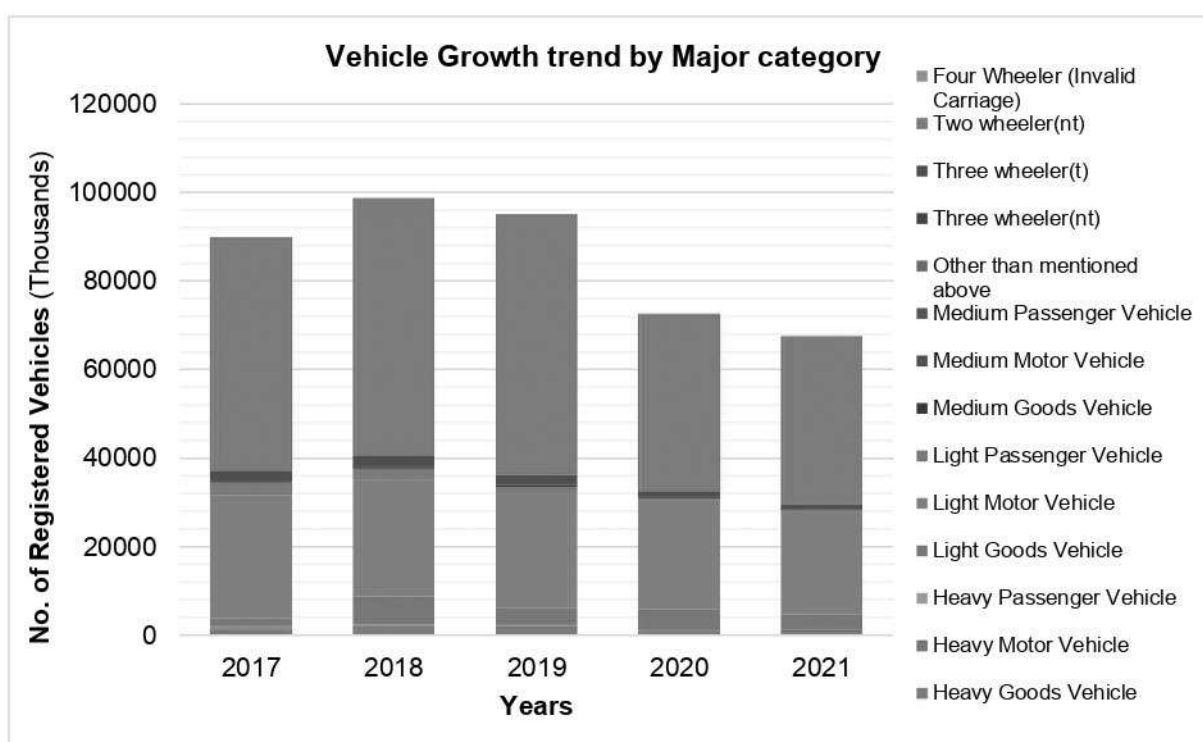


Figure 5-14 Vehicular growth trend as per major category

It can be inferred from Figure 5-14 that LMV- Non-Transport category (Four wheelers), the graph is quite fluctuating before 2019. Afterwards, it is decreasing and reaches its lowest in 2019-21. This also can be attributed to the saturation of the city.

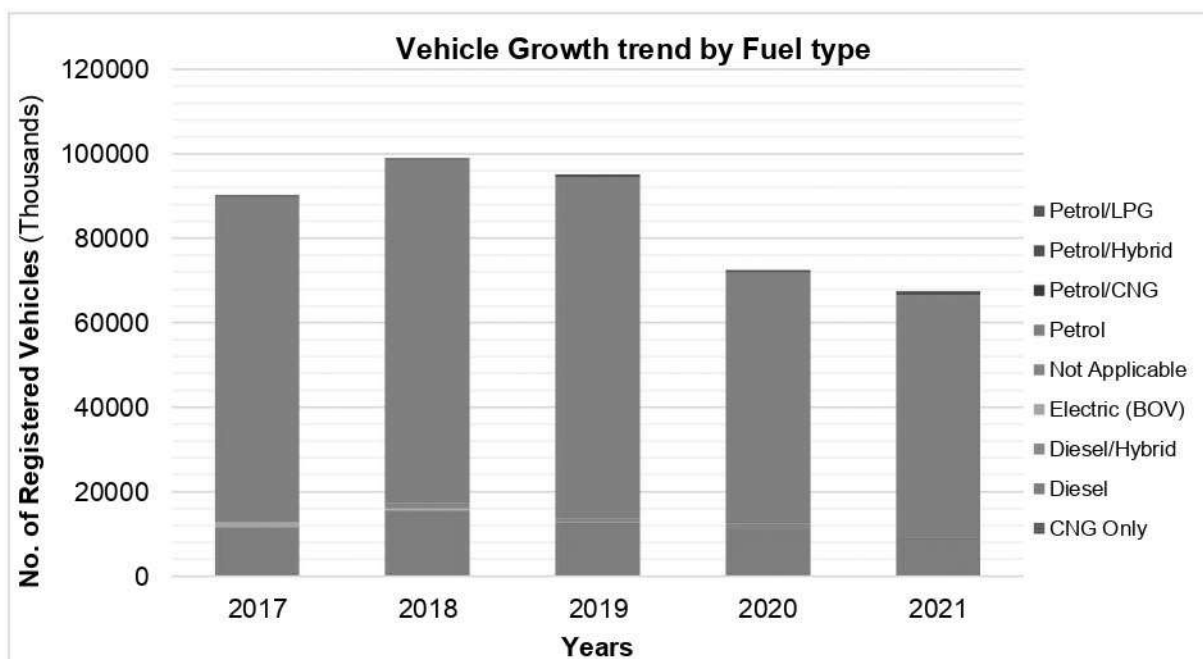


Figure 5-13 Vehicular growth trend by Fuel type

It is been observed continuous decrease in Petrol feeder vehicular registration after year 2018. Before 2019 the increase in petrol running vehicles was observed and afterwards, it is decreasing and reaches its lowest in 2021.

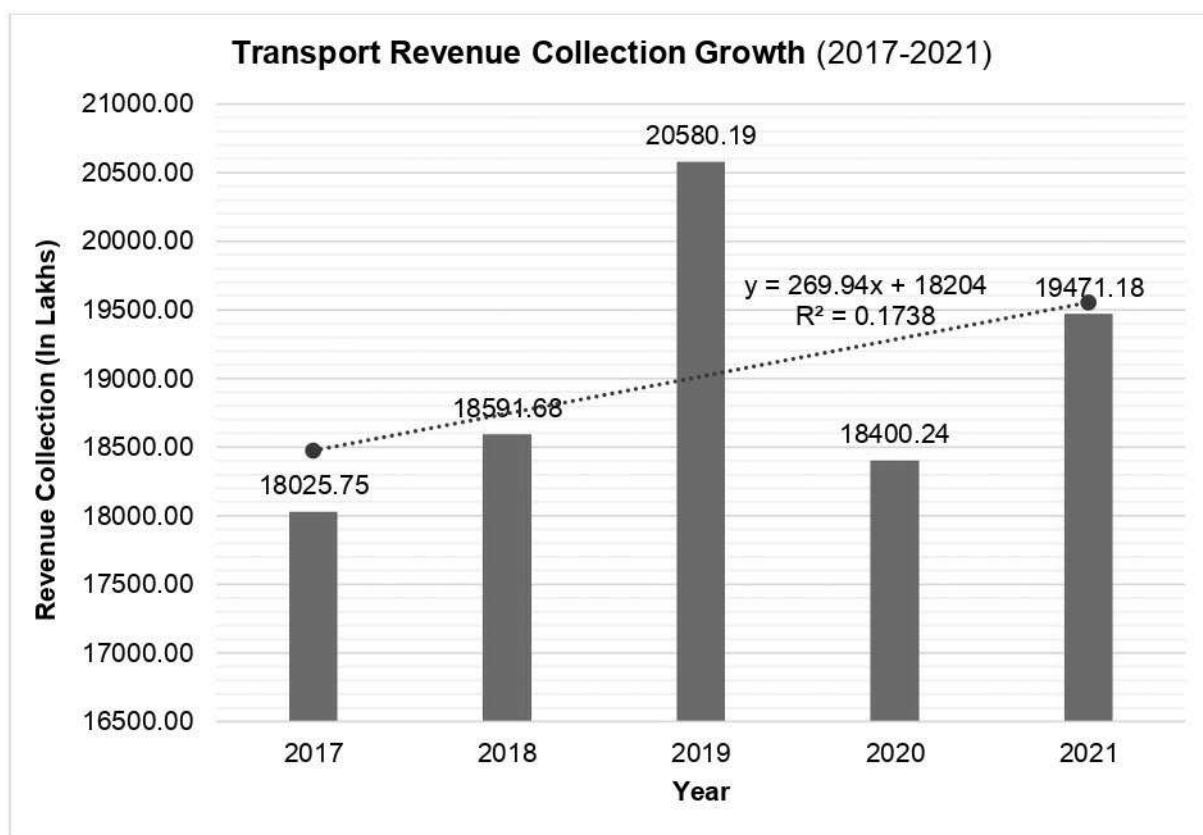


Figure 5-15 Transport revenue collection growth trend (2017-2021)

Table 5-14 Growth in vehicular revenue collection

Revenue Collection		
Year	Collection (Lakhs)	% of Growth
2017	18025.75	-
2018	18591.68	3.14%
2019	20580.19	10.70%
2020	18400.24	10.59%
2021	19471.18	

(Source: DTO, Guwahati)

Maximum vehicular revenue collection was observed in year 2019. However, the revenue collection observed fluctuating from year 2017 to 2021 and it observed lowest in year 2017.

Table 5-15 Monthly Transport vehicular population growth in year 2019

Sr. no		Nature of figures		Transport Vehicle																																					
				Trucks				L.C.V Goods		Buses				Taxis																											
Months		Multiaxle vehicle		Articulated vehicles		Ambulance		Medium		Heavy		Dumper		Excavator		Four-wheeler		Three-wheeler		Contract /Stage Carriage		Omni Buses/T Bus		Minibuses		School Buses		A.A.T.O.V		Motor cabs		Maxi Cabs		Other Taxi		Passenger three-wheeler		E-Rickshaws (P)		Total	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19																					
1	April'19	0	0	2	10	212	34	25	74	123	4	6	5	15	0	66	4	0	25	0																			605		
2	May'19	0	0	1	21	145	24	17	189	135	8	9	5	11	0	126	4	0	51	0																	746				
3	June'19	0	1	2	23	157	22	15	110	108	15	6	3	15	0	115	5	0	15	0																	612				
4	July'19	0	0	5	10	125	19	16	170	115	23	4	11	8	0	139	1	0	33	0																	679				
5	Aug'19	0	0	5	12	129	18	26	168	116	29	9	8	12	0	156	6	0	32	0																	726				
6	Sept'19	0	0	7	12	198	17	33	149	106	35	15	8	7	0	171	8	0	73	0																	839				
7	Oct'19	0	3	4	16	130	42	54	205	156	25	3	8	9	0	216	20	0	105	0																	996				
8	Nov'19	0	3	4	16	151	50	76	240	133	21	1	8	12	0	153	13	0	89	0																	970				
9	Dec'19	0	0	4	12	73	38	53	183	65	15	2	6	3	0	105	7	0	45	0																	614				
10	Jan'19	0	0	3	11	102	25	48	205	83	14	2	21	6	0	114	8	0	51	0																	693				
11	Feb'19	0	0	4	15	236	59	60	349	117	19	4	17	4	0	115	11	0	56	0																	1066				
12	March'19	0	0	5	24	273	138	30	399	76	16	6	5	20	0	84	3	0	41	0																	1120				
		0	7	46	182	1931	486	453	2441	1333	224	67	105	122	0	1560	90	0	619	0																			9666		

Table 5-16 Monthly Non-Transport vehicular population growth in year 2019

Sr. no	Nature of figures	Non-Transport Vehicle															
Months	Tractor comm.	Trailer comm.	Construction Equipment vehicles	Excavator	Crane mounted vehicle	M/cycle/Scooter	M/cycle/scooter with side car	Moped	Motor Car	Omni bus (private use)	Three-wheeler(personal)	Vehicle fitted Generator	Govt. Vehicle	Fire Brigade	Others	Total	
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34		
1	April'19	20	0	2	0	0	5038	0	9	2041	0	0	98	0	0	405	
2	May'19	48	0	2	0	3	5661	0	3	2152	0	0	125	0	0	7208	
3	June'19	31	7	1	0	5	4779	0	6	1916	0	0	137	6	0	7994	
4	July'19	40	1	1	0	4	4642	0	9	1914	0	0	93	0	0	6888	
5	Aug'19	24	0	1	0	3	5260	0	4	1833	0	0	74	0	2	6704	
6	Sept'19	4	12	0	0	5	5486	1	2	2572	0	0	97	0	0	7201	
7	Oct'19	8	1	1	0	2	7004	1	2	2809	0	0	185	0	0	8179	
8	Nov'19	8	2	6	0	8	4293	1	2	2068	0	0	63	0	0	10013	
9	Dec'19	3	3	3	0	2	2110	0	0	1311	0	0	58	0	0	6451	
10	Jan'19	3	0	0	0	3	2934	0	2	1459	0	1	60	0	4	3490	
11	Feb'19	58	22	9	0	4	3794	0	3	1899	0	0	93	0	11	4466	
12	March'19	114	49	2	0	1	3352	0	3	1878	0	0	45	8	3	5893	
		361	97	28	0	40	54353	3	45	23852	0	1	1128	8	20	80347	

(Source: District transport office, Guwahati)

(Source: District transport office, Guwahati)

5.6 Vehicle Projections

Vehicle registration is essential to establish link between a vehicle and an owner or user of the vehicle. In the table 5-11 given before, categories of public and private vehicles along with their numbers mentioned. The information has been provided by the District Transport Office, Guwahati. The categorization has been done based on transport and non-transport use. Further in table 5-13, the number of vehicles is depicted in LMV (light motor vehicles) and HMV (heavy motor vehicles).

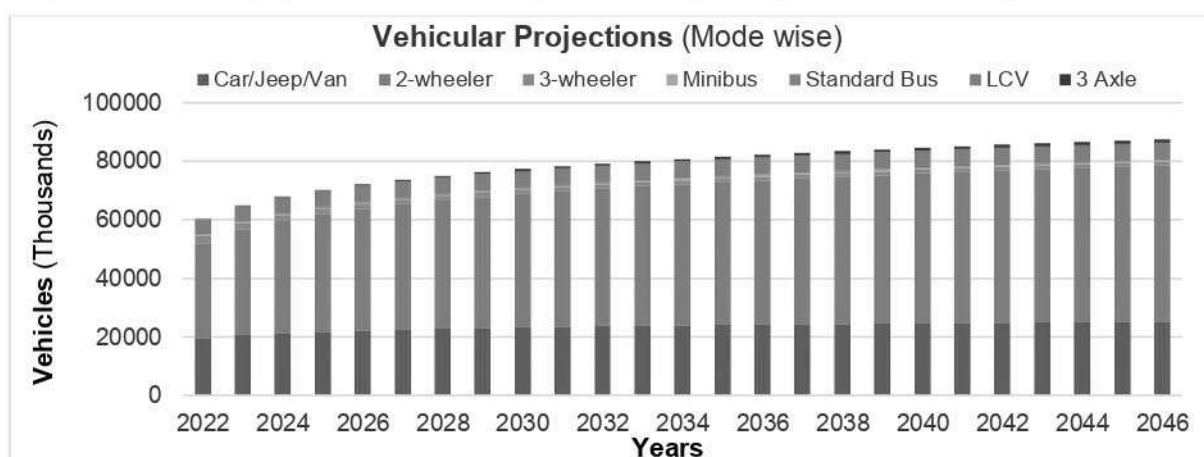


Figure 5-18 Mode wise vehicular projections by year 2045

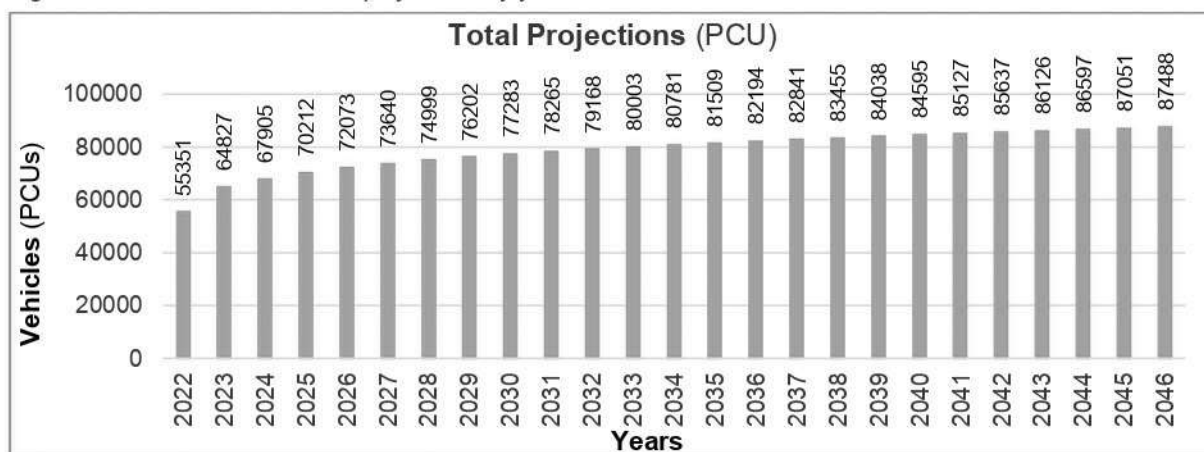


Figure 5-16 Vehicular projection in PCU by year 2045

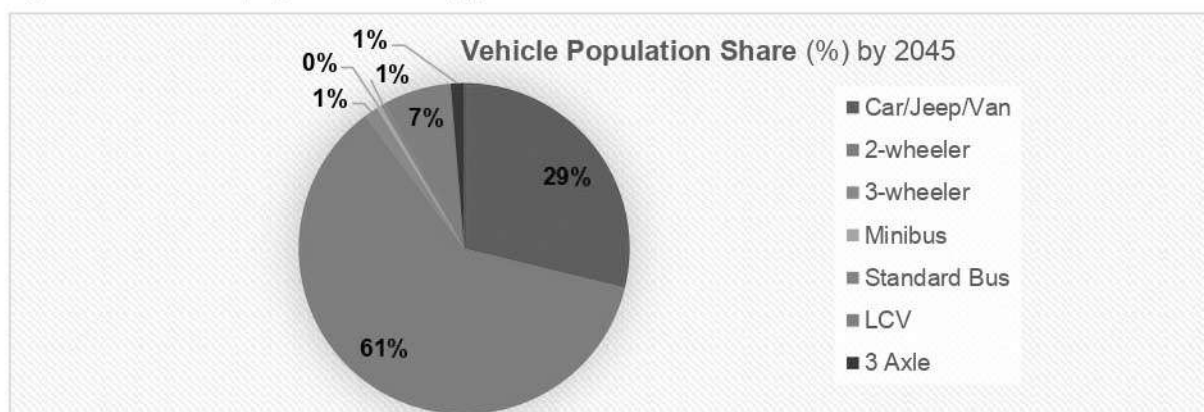


Figure 5-17 Vehicle population share by year 2045

Table 5-17 Mode wise yearly vehicular projections up to year 2045

Vehicle Types	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Car/Jeep/Van	19411	20535	21222	21724	22121	22451	22734	22982	23202	23402	23584	23751	23906
2-wheeler	32496	36162	38495	40241	41650	42837	43868	44780	45601	46348	47034	47669	48261
3-wheeler	2556	2159	1955	1823	1726	1651	1590	1539	1495	1458	1424	1394	1367
Minibus	106	140	165	185	202	218	232	244	256	267	278	288	297
Standard Bus	403	400	399	398	397	397	396	395	395	395	394	394	394
LCV	5333	5432	5491	5533	5566	5593	5616	5636	5654	5670	5684	5697	5709
3 Axle	0	0	178	309	411	494	564	625	679	727	770	810	846
Total	60305	64827	67905	70212	72073	73640	74999	76202	77283	78265	79168	80003	80781

Vehicle Types	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Car/Jeep/Van	24050	24185	24312	24432	24546	24654	24757	24855	24949	25039	25126
2-wheeler	48816	49338	49832	50300	50745	51170	51576	51966	52340	52700	53047
3-wheeler	1343	1320	1300	1281	1263	1246	1231	1216	1202	1189	1177
Minibus	306	315	323	331	339	346	353	360	367	374	380
Standard Bus	394	393	393	393	393	392	392	392	392	392	392
LCV	5720	5731	5741	5750	5759	5767	5775	5782	5790	5797	5803
3 Axle	880	912	941	969	995	1019	1043	1065	1086	1106	1126
Total	81509	82194	82841	83455	84038	84595	85127	85637	86126	86597	87051

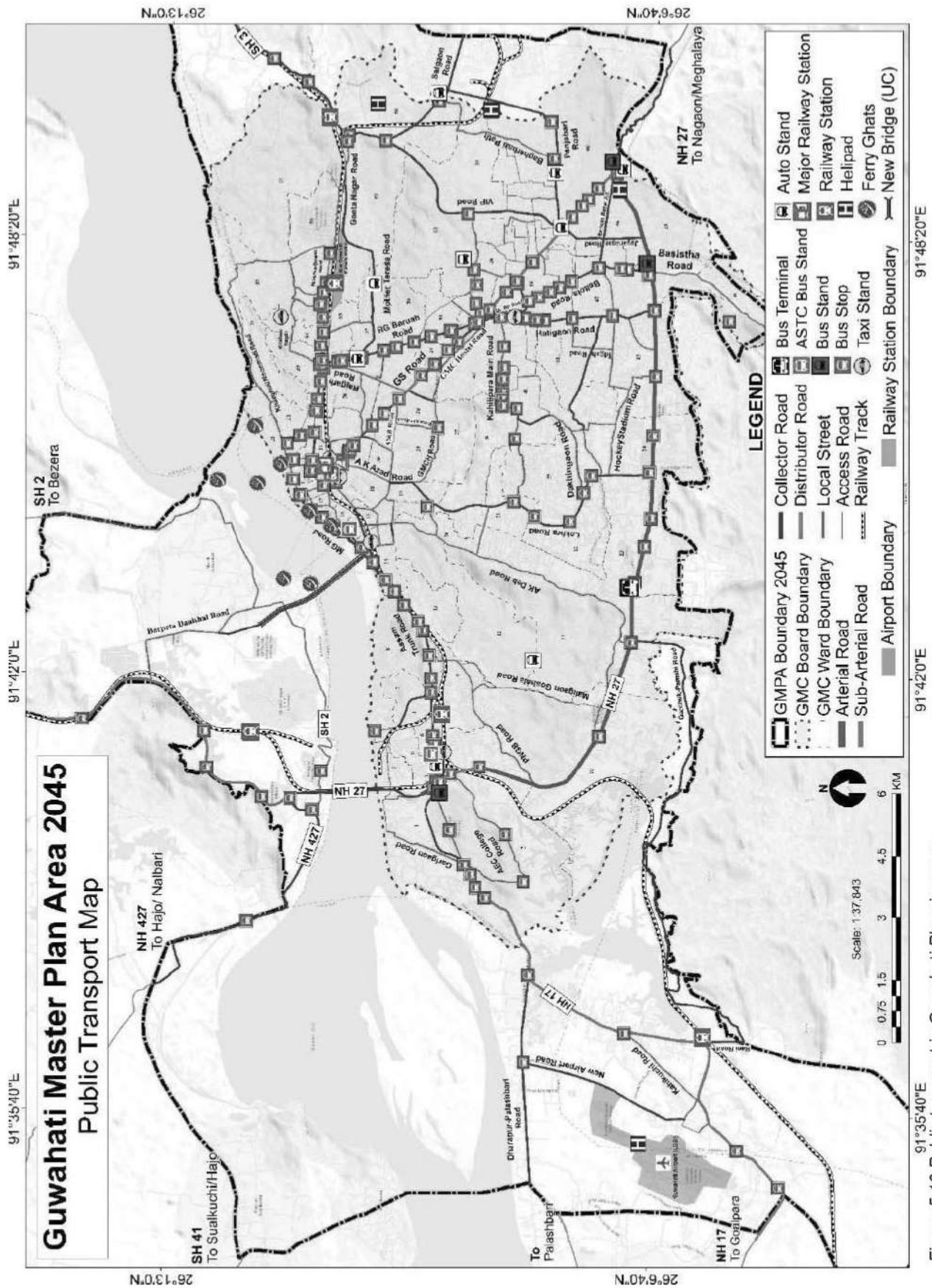
5.7 Public Transport

5.7.1 Public Transport and Routes

Passenger movement as well as their related concerns in the city transport sector play a critical role enabling productivity of the city system and promoting the welfare of the city and its region. The town has both railway and bus terminus which increases the chances of trade and commerce with other towns and free flow movement of people from one place to another. Guwahati is major town not only for Assam but for entire northeast region because of its' prominent location.

The city has Airport, major bus terminals which provides services to all the northeast states. The major northeast frontier railway is situated in Guwahati, one is in Paltanbazar and another one is in Kamakhya. The city has intercity bus services connecting different neighbourhood of Guwahati along with this there are E-rickshaws and taxis services Guwahati city has evolved around the bank of Brahmaputra. The city has an elaborated city bus services run by Special purpose vehicle named Assam State Transport Corporation. The public transport points such as Railway Stations, ASTC Bus terminal, Bus Stand, Bus Stops, Auto stand, and taxi stands are mentioned in the Figure 5-19.

The south bank has major portion while the north of Guwahati city new and still evolving as a city. To transport from south bank to north bank of Brahmaputra there are two types of transportation one is Ropeway and other is Ferry services. These services have trip intervals and move over the stretch of Brahmaputra. The ferry service has major route not only from south to north bank but also for nearby town and villages.



5.7.1.1 **Bus Terminals**

The Assam State Transport Corporation (ASTC) bus depot operates in the city to connect to nearby cities of the district and other major cities of the state, like Dibrugarh Shillong, Itanagar, Aizawl, Agartala. ASTC have major junction point in Guwahati city as this connects the rest of north-eastern region of India. There are regular bus services connecting Guwahati by road with nearby cities.

The main roads are defined transport corridors in the city. Therefore, primary emphasis should be on consolidation of existing networks and then expanding it; bus depots proposed at suitable intervals along with the other infrastructure for the bus system. Existing bus stops lacks the same. In the integrated transport network concept, terminals are very important components as they enable integration between the different modes of the system.

Table 5-18: Bus Transportation Facility in GMPA

Terminal Centre	Location	Observations
A. Inter city	Bus station	
1. Passenger	ISBT, Guwahati	Located at Betkucchi on NH-37. Campus of the bus station requires passenger landing boarding platform facility. Inadequate sanitation and basic amenities. All the necessary facilities should be improved providing modern technology through proper planning.
	A.S.T.C bus station, Paltan Bazaar Road.	Located on Paltan Bazaar, organized parking space. With shade for waiting area, toilet facilities should be extended. Passengers guest house facilities should be provided. It's a big ASTC Bus terminal with good infrastructure facilities.
	Machkhowa A.S.T.C bus station, Jail Road	Located at Jail Road, Small and contemporary parking space.
B. Inter city	Railway stations	
	Guwahati Railway Station	Railway station should be developed providing all modern facilities. Platform awaiting shed should be upgraded. Guest house facilities should be established.
	Kamakhya Railway Station	Platform with small periphery, but basic Infrastructure is developed. Booking and Reservation counters adequate. At all, the platform is required to be upgraded providing all modern facilities.
	Pandu Railway Station	Very small and underdeveloped station but not much railway links.

Expect the existing A.S.T.C bus terminus located in the heart of the town, the other public and private Bus stands are most temporarily located at some busy roadsides which causes the traffic congestion and traffic. The bus stands located at different places of the town and their characteristics are as given below

5.7.1.1.1 **ASTC**

Assam State Transport Corporation was constituted under Road Transport Corporation Act 1950 with effect from 31st March 1970. Before christened as a corporation, it was a wing of Transport Department of Government of Assam. It came to effect from 16th January 1948 as "Road Transport, Assam" under Home Department. There are 135 stations and 3 Inter State Bus Terminals across the state



with a fleet of more than 1100 buses with another fleet of more than 1200 Private Owned Buses operated under banner of ASTC. ASTC is now the lifeline of Transport Connectivity of the state as it operates buses even in the rural areas besides operation on highways and city roads.

Table 5-19: Category wise number of buses

Categories	Volvo	Ultra	EV	Pink	Bharatbenz	JNNURM	Lynx	RCV	Total
No. of buses	20	162	13	25	5	61	7	45	338

(Source: Assam State transport corporation, 2020)



5.7.1.1.2 Inter State Bus Terminal (ISBT)

The Inter State Bus Terminal, (ISBT) is a bus terminal that provides bus service to destinations located in other state. In Guwahati ISBT provide bus services with North-eastern state of India, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal including other nearby states. It provides



different kinds of services like, online ticket bookings, the infrastructure is well developed in Guwahati ISBT, parking bays, commercials, and other waiting facilities for the passengers. Bus Services of ISBT covers rural and hilly roads, highways as well as city roads across the state.

ISBT operates a fleet of 585 buses including Hi-Tech Luxury (AC/Non-AC) buses for long distances and Hi-Tech semi and mini deluxe bus services for city and rural areas. There are also many private buses operating under ASTC. In 2013, the corporation mooted a proposal to implement a Global Positioning System-based tracking system to ensure efficient city services.

Table 5-20: Overall ASTC bus service details

ISBT, ASTC Bus services	
Passenger flow avg. per day per route	32.39 (1714289 total passengers in 2019-20/ no. of routes (145) in 365 days.)
No. of trips generated per day	522 per day
Revenue earned	Guwahati city service – Rs.2119.50 lakhs ASTC state-wide (only from own bus) – Rs.8354.91 lakhs
Passenger Carrying Capacity per Bus	47 (35 seats +12 standing)
No. of depots for maintenance	2 Nos. of Depots 1. Central workshops 2. Divisional workshops
Location of depots	Rupnagar, Guwahati
No. of Bus stops	165
Terminal location	ISBT Betkuchi, Guwahati (Bypass)
No. of Parkings bay in ISBT	46
No. of Buses and passengers traveling within the city	253 & 1714289 passengers in the year 2019-20

5.7.1.2 Major Bus Stop

The major bus stop in the city has been mentioned in the Table 5-21 described below.

This bus stop is in the Master plan area.

Table 5-21 Major Bus Stops of Guwahati MP Area

Major Bus Stops		
Khanapara	Paltanbazaar	Games village
Six miles	Lachit nagar	Kamakhya gate
Rukminigaon	Ulubari	Machkhowa
Christianbasti	Gauhati High court	Chandmari colony
Bhangagarh	Baralmukh	Narengi
Maligaon Chariali	Lokhra	Beharbari
Jalukbari	ISBT	Ganeshguri
Fancy bazaar	Lalmati	Zoo road

(Source: Compiled by Consultants)



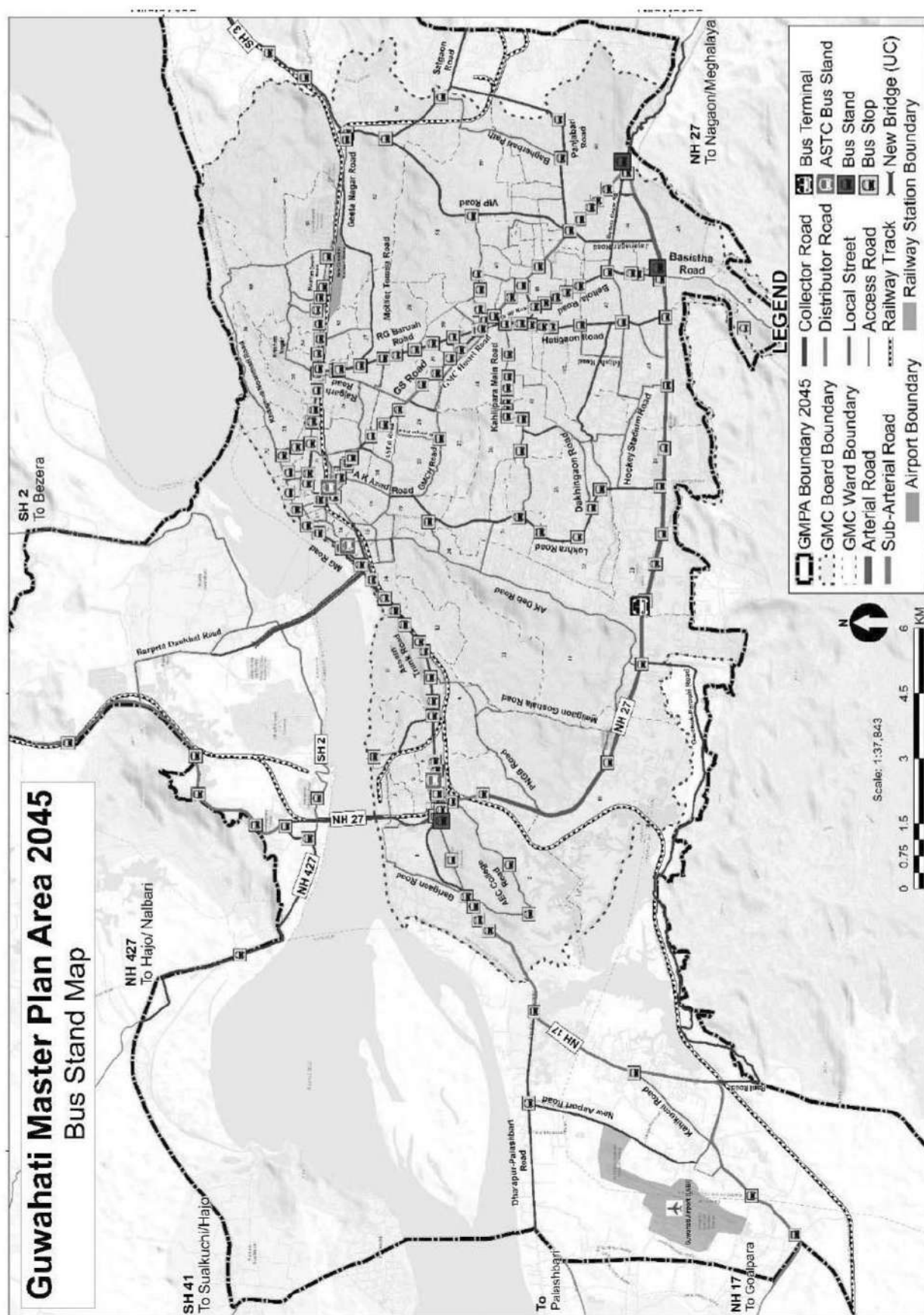


Figure 5-20 Guwahati Bus Stand Location Map

5.7.1.3 Railway Station

Guwahati planning area encompasses six railway stations and have been mentioned in the Table 5-22 below with the location. However, Guwahati Railway station, Kamakhya Railway Station, Azara, Agthori and Narangi stations are majorly serving passenger transportation. The New Guwahati station has no platform. It's just a passing through station with no train stopping. It's Assam's first BG diesel locomotive shed. The area serves as a passenger and goods train yard. The new Guwahati railway station is mobilizing major goods and freight to entire north east. The Guwahati and Kamakhya section of NF is the most vital link of Assam and further states like Arunachal Pradesh. Kamakhya railway station is basically designed to reduce the traffic of Guwahati Railway station and many of trains were diverted towards Khamakhya Station.

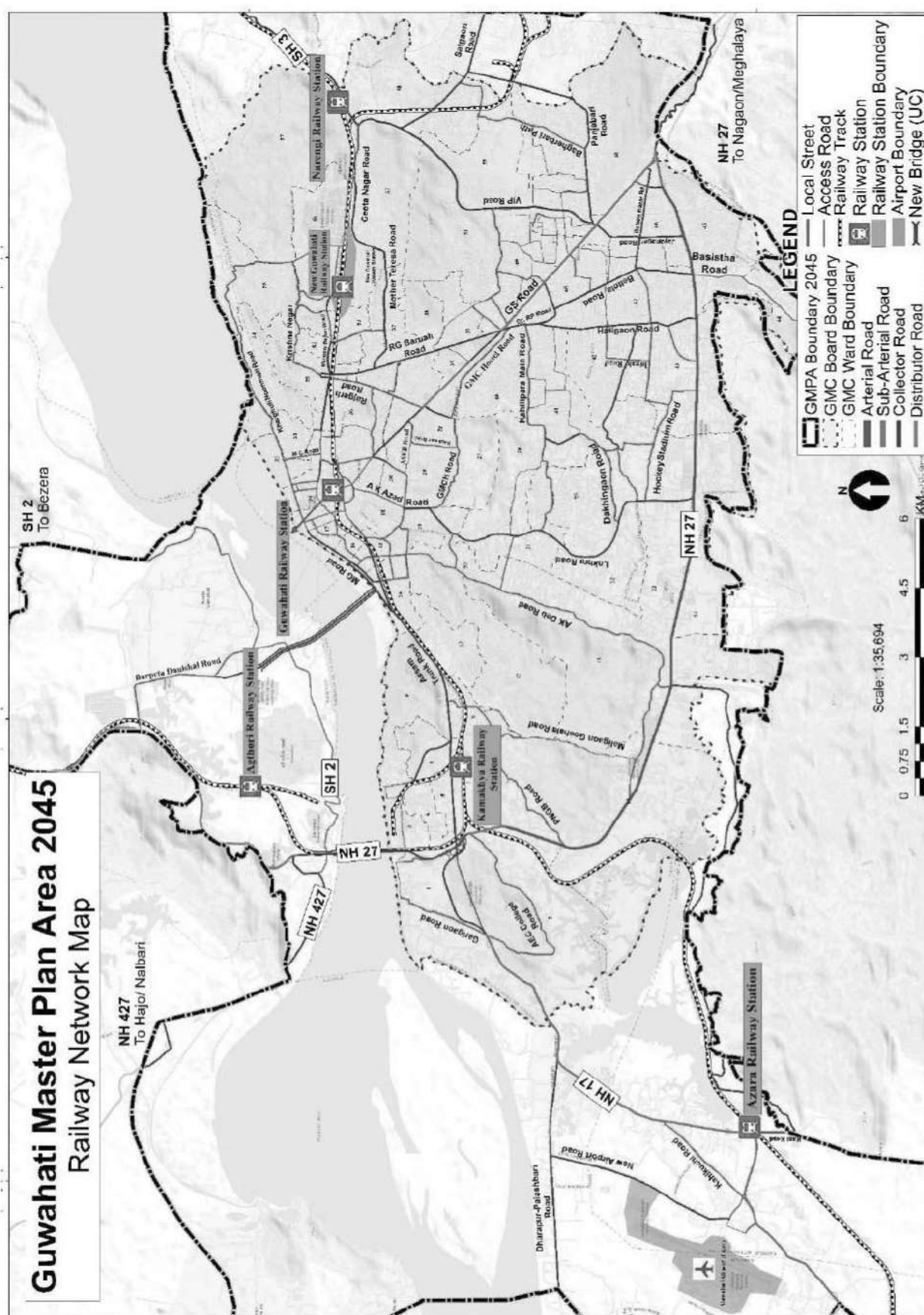
Stations like New Guwahati and Agyathori are

Table 5-22 Railway Station in Guwahati master plan area

Railway Station	Location
Guwahati railway station (Major)	Paltan Bazaar, Guwahati
Kamakhya Station	Maligaon, Guwahati
New Guwahati Station	Noonmati, Guwahati
Azara Railway Station	Azara, Guwahati
Narangi Railway Station	Narangi, Guwahati
Agyathori Railway Station	Agyathori, Guwahati

(Source: Compiled by Consultants)





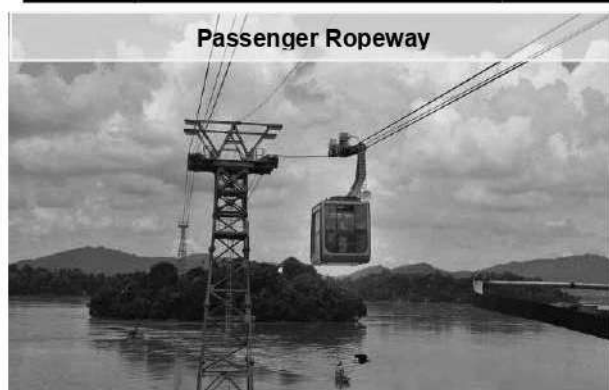
5.7.1.4 Passenger Ropeway

The Guwahati Ropeway across the Brahmaputra, connecting the Southern and Northern banks of the Brahmaputra River, has been recently opened for the public and has become a popular tourist attraction. It is 1.8 kms long and take around 10-12 minutes to cross the river. On the south bank, it is located just on the opposite side of Nehru Park. This is a busy area with many major landmarks of Guwahati including the High Court and the Cotton College. On the Northern side, it is near Rajadwar village, behind Dolgovinda which is a popular temple. Operational hours are from 8:30 am to 4:45 pm. The ticket pricing for single person is rs.60. and tickets for 2 ways are for Rs.100. The two ways tickets will be validated for 3 hrs only.

5.7.1.4.1 Passenger Ropeway Features

Table 5-23: Ropeway service details

Sr.no	Entities	Features
1	Length	1820 m
2	No. of terminals	2
3	Lower Terminal	Panbazar Guwahati, in front of Nehru Park
4	Upper Terminal	Rajadwar village, behind Dolgovinda Temple
5	Facilities in Terminal	Passenger handling area, ticket counter, parking facility, public convenience area
6	No of Trestles supports	5 (Near LTP & UTP, Umananda Island & 2 on riverbed with well foundation)
7	Travel Time	436 sec
8	Ropeway Type	Twin Track, Single Haul, Bi-Cable Double reversible Jig Back system
9	Ropeway Capacity	250 PPH (Persons Per Hour)
10	Cabin Capacity (persons)	30 + 1 (Passengers + Operators)
11	Rescue System	Self-driven carriage & cabin



5.7.1.5 Ferry services

Guwahati have inland water ways transport system, which connects it with nearby districts and Guwahati from north bank to south bank of Brahmaputra. The total boats are 2484. The ferry service operates on all weekdays from 7:30 am to 7:30 pm. South



Guwahati to north Guwahati, and from north Guwahati to south Guwahati it starts from 8 am till 8 pm. For Sundays, the services starts at 8:45 am to 5:30 pm from south Guwahati to north Guwahati. and at 9:15 am to 6:00 pm ferry serves from north Guwahati to Guwahati city. Guwahati to Rajaduar and Guwahati to Madhyamkhanda are two main routes for ferry service.

Table 5-24 Guwahati ferry service within GMDA

Sr. No.	Name of Ferry service connectivity	Division
1	Guwahati - Kurua	Guwahati
2	Guwahati - Rajaduar	Guwahati
3	Guwahati - Madhyamkhanda	Guwahati
4	Guwahati - North Guwahati	Guwahati
5	Guwahati - Kachamari	Guwahati
6	Auniati - Silsaku- Guwahati	Guwahati
7	Mukulma - Guwahati	Guwahati
8	Kurihamari - Guwahati	Guwahati
9	Guwahati - Maumari	Guwahati
10	Guwahati - Kirakara	Guwahati

Table 5-25 Guwahati ferry service outside GMDA

Sr. No.	Name of Ferry service outside of GMDA	Division
1	Nagarbera - Alupatti -Majarchar	Guwahati
2	Adabari - Kurihamari - Sialmari	Guwahati
3	Dhubri-Fakirganj,	Guwahati
4	Jaleswar- Dhubri	Guwahati
5	Phulbari-Dhubri	Guwahati
6	Lengtisinga - Santoshpur – Bortar	Guwahati

7	Pandu - Amingaon	Guwahati
8	Chandrapur - Kirakara	Guwahati
9	Barghola - Kahibari - Telipukhur	Guwahati
10	Palashbari - Sualkuchi	Guwahati
11	Bamundi - Sialmari - Guimari	Guwahati
12	Hauhowa - Sambaria-Bhogdia- Directory	Guwahati
13	Sunsali - Kurua	Guwahati
14	Chutiagaon - Dimburchar	Guwahati
15	Dhing - Singiri	Guwahati
16	Lawkahowa- Tezpur	Guwahati
17	Barchala - Moirabar	Guwahati
18	Chaparmukh- Kachua	Guwahati

5.7.2 Urban Passenger Transport

The Guwahati region has city bus transportation facilities managed by Assam State Transport Corporation (ASTC). The City service division of the ASTC has been operating within the city as well as suburban areas covering entire Guwahati Planning Area, connecting the following places namely Laharighat, Morigaon, Milanpur, Jagiroad, Maloibari, Goreswar, Hajo, Suwalkuchi, and many more towns. Apart from that, there are private bus operators who operates bus from Guwahati to other cities and within the region as well. The details of private buses are as below

Table 5-26 Details of Privat Buse in Guwahati

Bus Type	Vehicle no.	Origin	Destination	No. of Trips
Private	1635	Laharighat	Guwahati	1
Private	1635	Guwahati	Laharighat	1
Private	1607	Marigaon	Guwahati	1
Private	1607	Guwahati	Marigaon	1
Private	1953	Milanpur	Guwahati	1
Private	1953	Guwahati	Milanpur	1
Private	1954,1906,1794	Jagiroad	Guwahati	3
Private	1954,1906,1794	Guwahati	Jagiroad	3
Private	1609	Maloibari	Guwahati	1
Private	1609	Guwahti	Maloibari	1
Private	1428,1429,1949,1965	Goreswar	Guwahati	4
Private	1428,1429,1949,1965	Guwahati	Goreswar	4
Private	1034	Gourmo	Guwahati	1
Private	1034	Guwahati	Gourmo	1
Private	1912	Guwabari	Guwahati	1
Private	1912	Guwahati	Guwabaria	1
Private	978	Ketekibari	Guwahati	1
Private	978	Guwahati	Ketekibari	1
Private	1913,1889,1798,1922	Hajo	Guwahati	4
Private	1913,1889,1798,1922	Guwahati	Hajo	4
Private	1775,1915	Ramdia	Guwahati	2
Private	1775,1915	Guwahati	Ramdia	2
Private	1924,1916,1886,1998,1086,1186	Suwalkuchi	Guwahati	6
Private	1924,1916,1886,1998,1086,1186	Guwahati	Suwalkuchi	6
Private	1908	Bamundi	Guwahati	1
Private	1908	Guwahati	Bamundi	1
Private	1792,1460,1892	Chaigaon	Guwahati	3

Private	1792,1460,1892	Guwahati	Chaigaon	3
Private	1686	Daranga	Guwahati	1
Private	1686	Guwahati	Daranga	1
Private	1610	Kauli	Guwahati	1
Private	1610	Guwahati	Kauli	1
Private	1920	Tamulpur	Guwahati	1
Private	1422	Allia	Guwahati	1
Private	1422	Guwahati	Allia	1
Private	1952	Kalakuchi	Guwahati	1
Private	1952	Guwahati	Kalakuchi	1
Private	1596	Gokhanighat	Guwahati	1
Private	1596	Guwahati	Gokhanighat	1
Private	1695	Borajal	Guwahati	1
Private	1695	Guwahati	Borajai	1
Private	1606	Pandula	Guwahati	1
Private	1606	Guwahati	Pandula	1
Private	1644	Polokata	Guwahati	1
Private	1644	Guwahati	Polokata	1
Private	1643	Rangatoli	Guwahati	1
Private	1643	Guwahati	Rangatoli	1
Private	1480	Tapalia	Guwahati	1
Private	1480	Guwahati	Tapalia	1
Private	1671	Borikadanga	Guwahati	1
Private	1671	Guwahati	Borikadanga	1
Private	1919	Bogrihati	Guwahati	1
Private	1919	Guwahati	Bogrihati	1
Private	1654	Bahjani	Guwahati	1
Private	1654	Guwahati	Bahjani	1
Private	1815	Kamarkuchi	Guwahati	1
Private	1815	Guwahati	Kamarkuchi	1
Private	1401	Baharghat	Guwahati	1
Private	1401	Guwahati	Bharaghat	1
Private	1818	Kamalpur	Guwahati	1
Private	1818	Guwahati	Kamalpur	1
Private	1692	Soneswar	Guwahati	1
Private	1692	Guwahati	Soneswar	1
Private	972	Japia	Guwahati	1
Private	972	Guwahati	Japia	1
Private	1950	Posaria	Guwahati	1

Private	1950	Guwahati	Posaria	1
Private	977	Borkapanitemato	Guwahati	1
Private	977	Guwahati	Borkapanitemato	1
Private	1587	Simulia	Guwahati	1
Private	1587	Guwahati	Simulia	1
Private	1955	Norddi	Guwahati	1
Private	1955	Guwahati	Norddi	1
Private	1772	Kokaya	Guwahati	1
Private	1772	Guwahati	Kokaya	1
Private	1558	P.Kakakuchi	Guwahati	1
Private	1558	Guwahati	P.Kakakuchi	1
Private	1554	Bohari	Guwahati	1
Private	1554	Guwahati	Bohari	1
Private	1808	Nasatra	Guwahati	1
Private	1808	Guwahati	Nasatra	1
Private	1780	Sarthebari	Guwahati	1
Private	1780	Guwahati	Sarthebari	1
Private	1589	Doulasal	Guwahati	1
Private	1589	Guwahati	Doulasal	1
Private	1593	Biakuchi	Guwahati	1
Private	1593	Guwahati	Biakuchi	1
Private	1502,1791	Mukalmua	Guwahati	2
Private	1502,1791	Guwahati	Mukalmua	2
Private	1674	Laharkhata	Guwahati	1
Private	1767	Ukium	Guwahati	1
Private	1767	Guwahati	Ukium	1
Private	1358	Gagan	Guwahati	1
Private	1358	Guwahati	Gagan	1
Private	1947	Jaji	Guwahati	1
Private	1947	Guwahati	Jaji	1
Private	1925	Rani	Guwahati	1
Private	1925	Guwahati	Rani	1
Private	1799,1817,1891	Mirza	Guwahati	3
Private	1799,1817,1891	Guwahati	Mirza	3
Private	1910	Sabansha	Guwahati	1
Private	1910	Guwahati	Sabansha	1
Private	1776,1814,1820	PLB to JRD	Guwahati	3
Private	1776,1814,1820	Guwahati	PLB to JRD	3

Private	2076	Hajo	Guwahati	1
Private	2076	Guwahati	Hajo	1
Private	2056	Goalpara	Guwahati	1
Private	2056	Guwahati	Gaolpara	1
Private	1794	Guwahati	Nalbari	1
Private	1794	Nalbari	Guwahati	1
Private	1985	Mangaldoi	Guwahati	1
Private	1985	Guwahati	Mangaldoi	1
Private	1653	Jagra	Guwahati	1
Private	1653	Guwahati	Jagra	1
Private	1908	Paltan Bazar	Nasatra	1
Private	1908	Nasatra	Paltan Bazar	1
Private	1808,1765	Noonmati	Dispur	2
Private	1808,1765	Dispur	Noonmati	2
Private	1793	Panjabari	Dispur	1
Private	1793	Dispur	Panjabari	1
Private	1913	Jalukbari	Dispur	1
Private	1913	Dispur	Jalukbari	1
Private	1887	Natnoma	Dispur	1
Private	1887	Dispur	Natnoma	1
Private	1891	Mirza	Dispur	1
Private	1891	Dispur	Mirza	1
Private	2262	Odalbakra	Dispur	1
Private	2262	Dispur	Odalbakra	1

Other state Private bus transport is also available. The transport services operated by transport corporations of Mizoram, Manipur, Aizwal, Tripura, Nagaland, West Bengal, and Meghalaya are operating through Guwahati using the available infrastructure.

5.7.2.1 City Bus Routes

ASTC city bus services running through the city on major arterial and urban link roads of the city. Presently, ASTC is in possession of total 225 city buses for public transportation playing in Guwahati city area and nearly 36,600 no. of total average daily ridership are taking facility of public transportation. There is total 19 identified main routes in the city through which ASTC city buses are commuting and catering trip demands generated in the city. Further mentioned in table are the identified 19 city bus routes in the city. In addition, the ASTC has procured 15 nos. of Electric vehicles and it is operational and utilized in the Guwahati city.

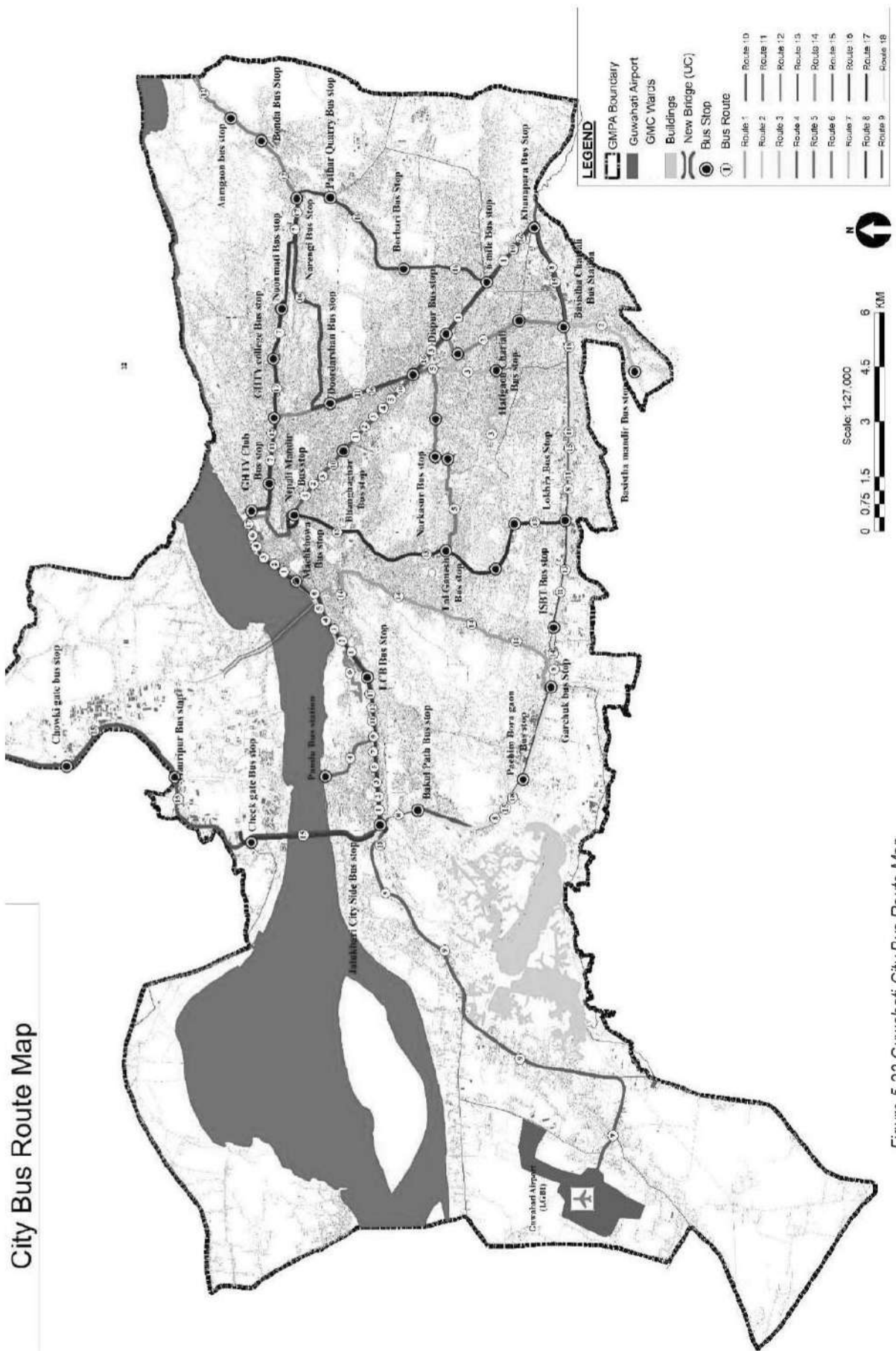


Figure 5-22 Guwahati City Bus Route Map

5.7.3 Intermediate Public Transport

In Guwahati region, there are two main types of intermediate transport systems prevailing. The first one is cycle, e-Auto rickshaw or taxi to collect the passengers from door to door. The other one is fixed route or informal public transport systems such as shared metro taxi autos, tempos & minibuses from prominent locations like bus stands, commercial streets, public institutes etc. For very short trips within the city and last mile travel to residential layout public transport system offer very less options and hence IPT systems play vital role in this segment as feeder to mass public transport systems. Auto stands are located at all prime points of the city in and around residential layouts, it is considered as the most affordable means of transportation next to Public Transport services.

The shuttle service is also mostly preferred by the working population who commute on a fixed route like from major residential settlements to city bus stand or prominent employment points within the planning area. The tricycle rickshaw is still in function especially in old bazars and prime market areas for pedestrians and consumers to have rapid and cheap accessibility to connect to the nearby major stations and locality.

Since the IPT supports especially for the poor, who cannot afford own private vehicles, it provides an alternative to transportation option to the public. Hence, the battery rickshaw are supporting the people to meet the travel of shorter distance of public as well as to cater the tourism population.

There are total 8 routes in the city where shared metro taxis are playing and feeding local traffic to public transport systems.

1. Nepali mandir to Balaji mandir via Lalganesh
2. Patharquarry to GMCH via Chandmari
3. Lalganesh to Notboma via Ganeshmandir
4. Rajgarh to Adabari
5. Bharalumukh to Balaji Mandir
6. Patharquarry to Adabar
7. Khanapara to Kalitakuchi
8. Khanapara to Amsing Jorbat via Gitamandir

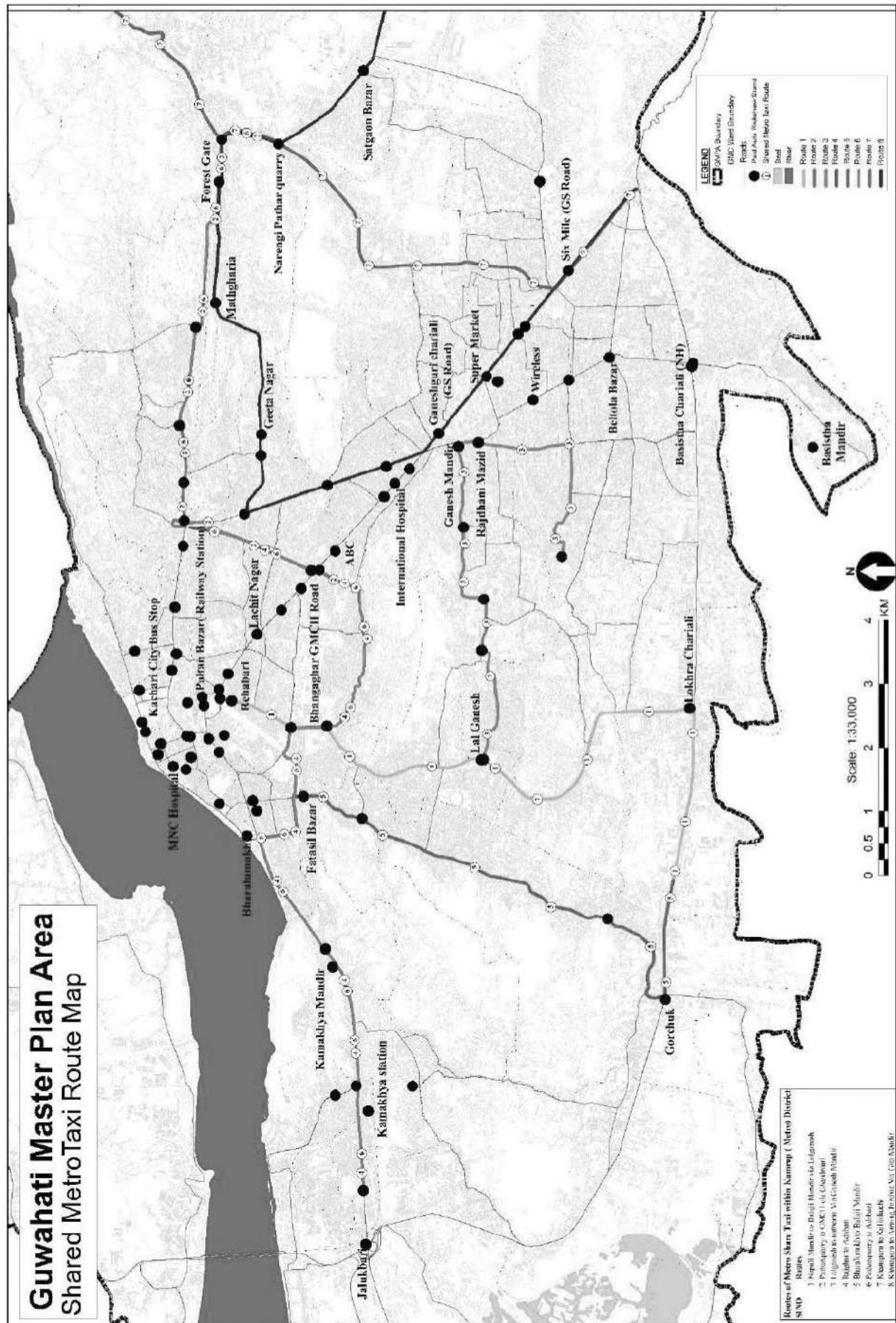


Figure 5-23 Guwahati Shared Metro Taxi Route Map

5.8 Freight & Logistics

Table 5-27 Freight zones and logistics

Logistics	Communication Hubs	Railways
<ul style="list-style-type: none"> - Inland Water Logistics - Ekart Logistics - DTDC Logistics 	<ul style="list-style-type: none"> - All India Radio 	<ul style="list-style-type: none"> - Guwahati Junction - Maligaon Junction - Pandu Junction - Agyathori junction
<ul style="list-style-type: none"> - Delhivery Courier - Jet airways Cargo - Chartered logistics - Assam Courier Cargo Service - TCI freight 	<ul style="list-style-type: none"> - BSNL Assam Telecom Circle, Dharapur Guwahati 	

Being a gateway city of entire northeast Guwahati functions as centre of communication, industry and healthcare in Assam and having well established transport, logistic, information and broadcasting network.

Guwahati, blessed with five mode transport accessibility, catalyses North-East to rest of India. Due to multiple transport activity city is having multiple inhouse warehouse & storage facilities. Guwahati Airport consist of its own warehouse for storage of goods and daily courier services. New Guwahati railway station consists bigger warehouses and logistics to accommodate interstate railway freight goods and Food Corporation of India (FCI) godown which is being utilised for Govt. grocery storage for public distribution. Moreover, Pandu port being oldest port of the Assam consist of cargo handling facility within the premises.

Being a metropolitan area, number of e-Commerce warehouses like Delhivery, Big Basket, E-Kart, Amazon and Myntra are handling e-Commerce trading and serving the city. There are number of private warehouses situated along the prime city bypass corridor NH-27 and Garchuk-Pamohi road on southern bank of Deepor Bil.

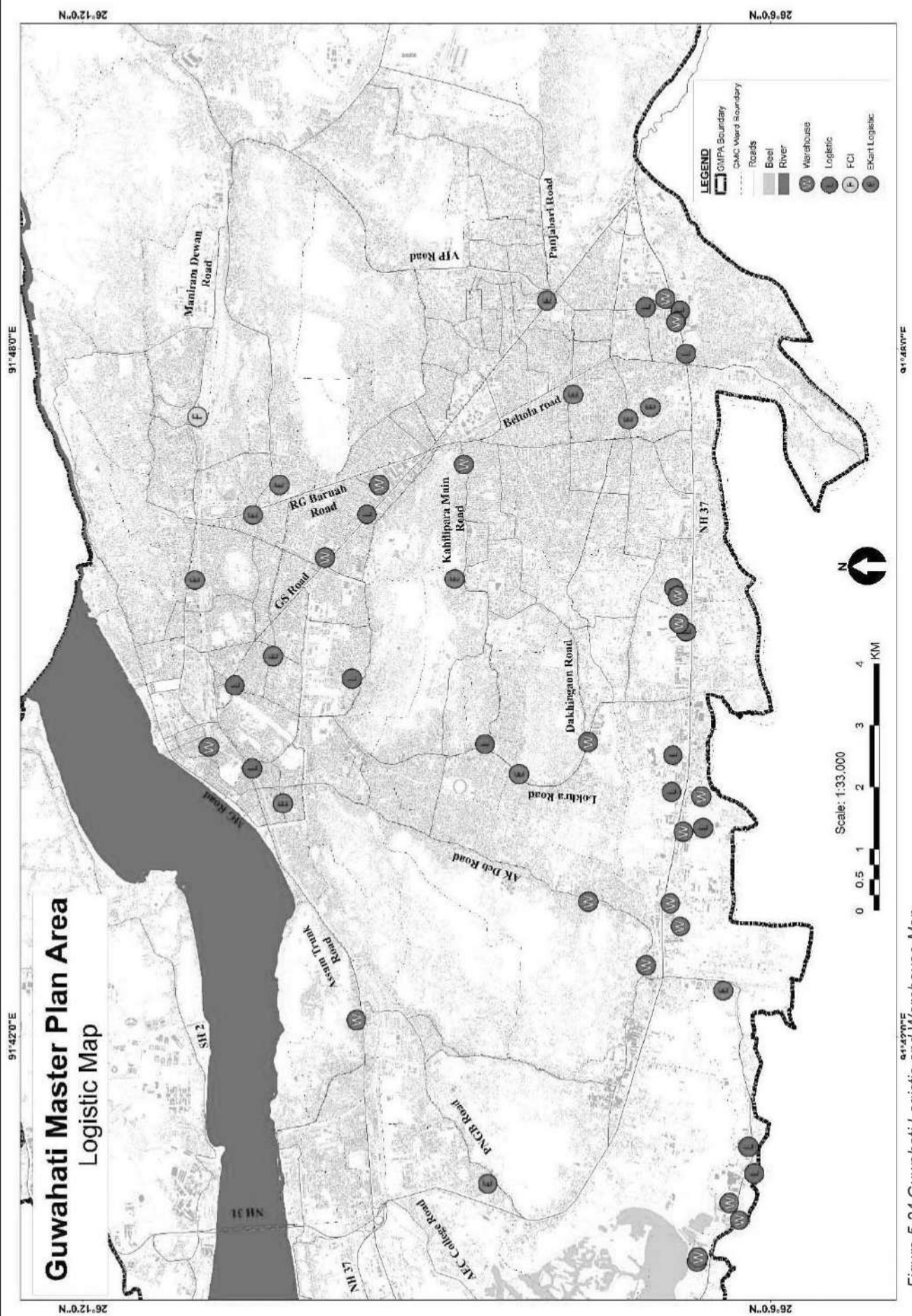


Figure 5-24 Guwahati Logistic and Warehouse Map

5.9 Traffic Characteristic

The traffic stream includes a combination of driver and vehicle behaviour. The driver or human behaviour being non-uniform, traffic stream is also non-uniform in nature. It is influenced not only by the individual characteristics of both vehicle and human but also by the way a group of such units interacts with each other. Thus, a flow of traffic through any street of defined characteristics will vary both by location and time corresponding to the changes in the human behaviour.

In Guwahati, due to lack of defined regulations, the characteristic of traffic varies vastly making it heterogeneous in character. A large number of vehicles move into and out of Guwahati Planning Area indicating the strong interrelationship between the Guwahati Region and its immediate region i.e. Urban Centers of Assam. Two wheelers accounted for a large share (40 to 60 %) and the share of cars was reasonably high on GS road. Traffic volume on internal city roads are high. Speeds on the local city collector roads are generally low ranging between 10 kmph and 27 kmph during the peak hour. Turning movements at intersections were high resulting in delays and queues. Major NERF railway line crisscrossing the city centre area from west to east corridor creates 11 road-railway regulated crossing in the city which leads delay and queues at the barrier in pick hours. Parking of vehicles is emerging as a major demand and critical problem. The limited capacities of narrow roads of the city are further eroded by parking of vehicles on both sides, all along the road stretches.

5.10 Road Accidents

The data in respect of road accidents that have been reported to the police department in the traffic police of Guwahati reveals the following data.

Table 5-28: Road Accident details (2001-19)

Sr. no	Year	Total Accident	Fatal Accidents	Total Injuries
1	2001	2516	1021	3744
2	2001	2625	1023	3843
3	2003	3262	1122	4361
4	2004	3688	1288	4313
5	2005	4258	1544	5540
6	2006	4694	1841	5435
7	2007	4403	1604	5697
8	2008	4683	1807	5081
9	2009	4869	1991	5522
10	2010	5828	2256	7579

11	2011	6569	2342	6505
12	2012	6535	2291	6709
13	2013	7211	2441	6609
14	2014	7144	2522	6499
15	2015	6959	2397	7068
16	2016	7453	2668	6963
17	2017	7170	2783	6163
18	2018	8248	2966	7375
19	2019	8350	3208	7473

From the table, it is clear that person injuries have decreased from 2010 to 2019 while the total accidents are gradually increasing from 2010. The Fatal accidents are consistent.

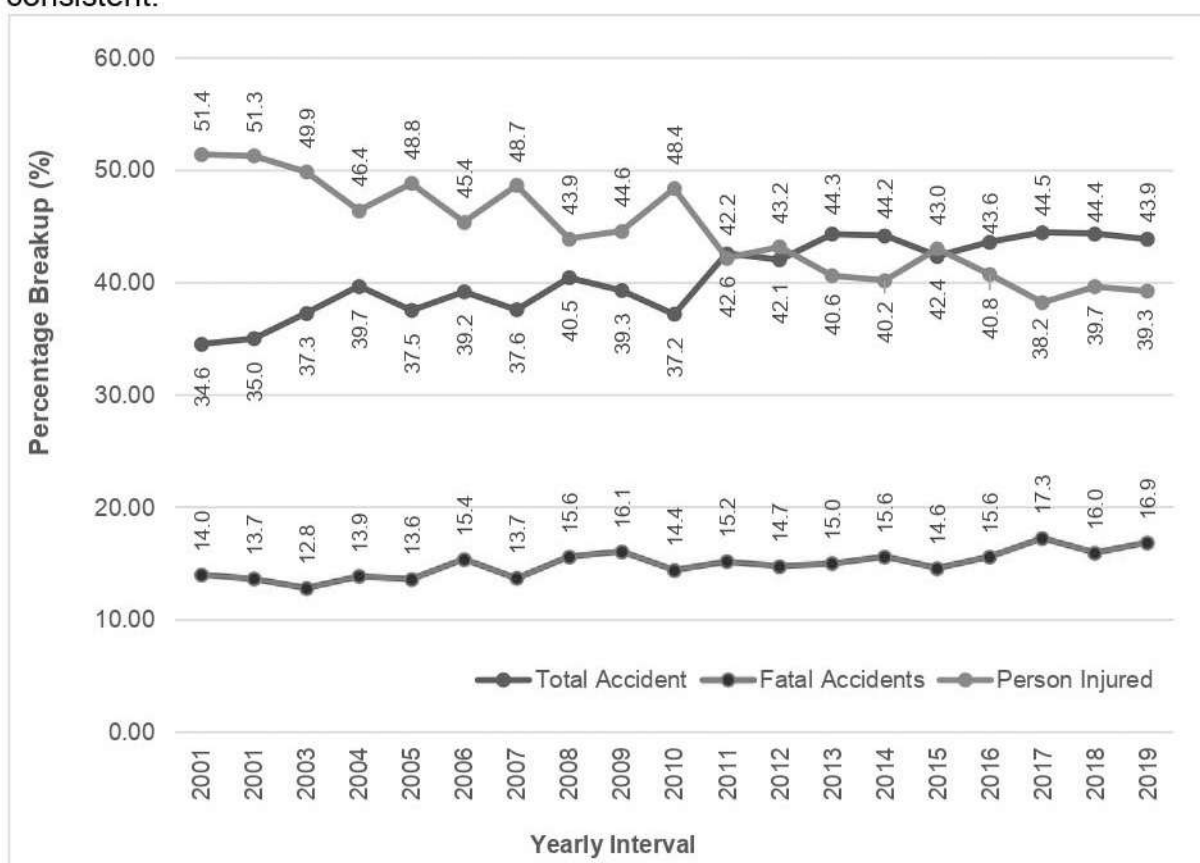


Figure 5-25 Details of accidents in Guwahati Area based on Fatalities & Injuries, 2001-19

From the above chart, it is observed that out of the total accidents reported in the Guwahati region the fatal injuries had remain stagnant from 14.0 % in 2011 to 16.9 % as per the Department of Traffic, Guwahati. On the other hand, total accidents has increased from 37.2% to 43.9% from year 2010 to 2019. However, accident with injuries has decreased from 48.4 % in 2011 to 39.3 % in 9 years from 2010 to 2019.

5.11 Traffic Survey and Analysis

A comprehensive methodology has been evolved to carry out the work. A stepwise methodology is presented in Figure 5-26

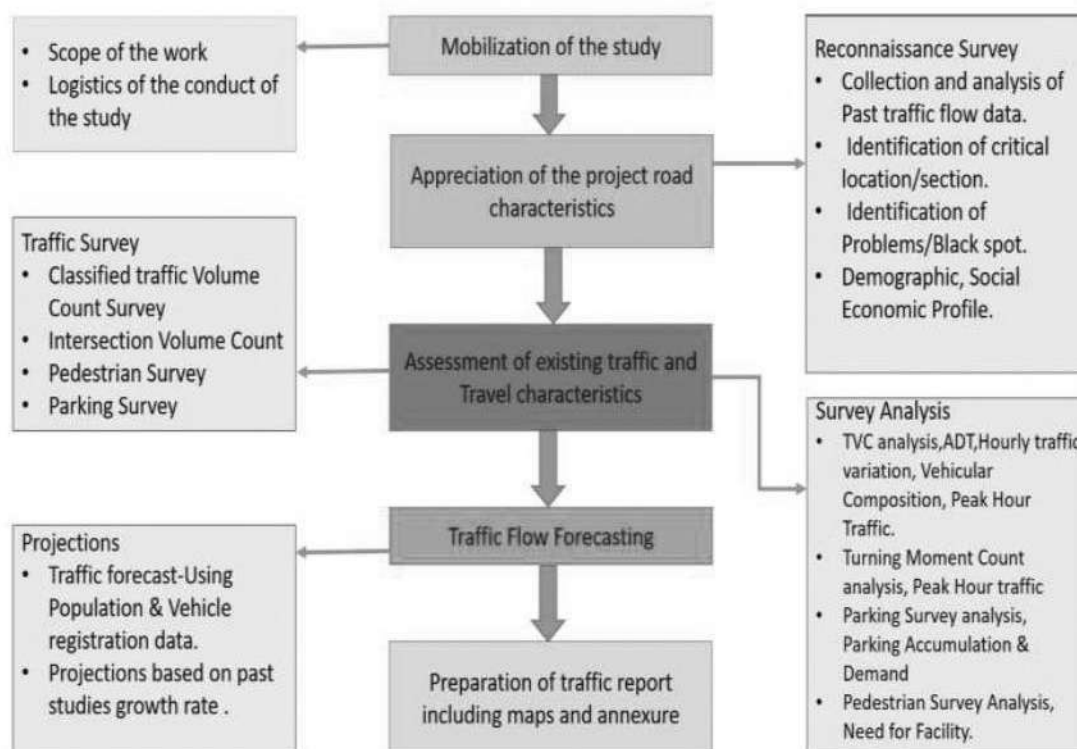


Figure 5-26 Traffic Survey Methodology

5.11.1 Types of Traffic Survey

Classified Traffic Volume Counts (CVC's) have been conducted using manual count by trained enumerators method at different locations. The survey locations are depicted in Figure 5-27 Traffic survey stations have been selected by the Consultant based on understanding of the road network as well as consideration of the following aspects:

- To represent critical traffic section
- To be a major influence area
- To be located at a level with good visibility

Based on the detailed reconnaissance of the project area, major traffic generators, major intersections and travel patterns, Classified Volume Count (CVC) locations and other surveys were identified at different locations of the city. The Classified Volume Count (CVC's) and Origin and Destination (O-D) Survey at a total of 22 locations in Guwahati Planning Area to understand traffic intensity in the Master Plan Area. Brief description and analysis of each of the above surveys are presented in the following sections. The locations of all traffic surveys is presented in Table 5-29.

Table 5-29 Traffic Survey Locations and Schedule

Sr. No	Type of Survey	Location
1	Classified Traffic Volume Count	NH -37 (Jalukbari to Khanapara)
		Kahilipara Road
		AT Road
		Beltola Road
		GS Road
		Dr. B Borooaha Road
		Dr. BK Kakati Road
		Mahapurush Madhabdev Path
		MG Road
		Gorchuk to Fatasil Ambari
		Lokhra Road
		Maniram Deewan Road
		Paltan Bazaar
		GMCH Road
		Zoo Road
		9 th Mile
		Guwahati to Goalpara
		Bahaita to Silla
		Dadara Hajo to GHY City
		GHY City to Majirgaon
		Ghy to Mandkata
		Panikhaiti to Narengi
2	Turning Movement Count (Junction Analysis) & Origin- Destination Survey	Guwahati Club
		Narangi Junction
		Fatasil Ambari Junction
		Gorchuk Junction
		Sarabhati Junction
		Beharbari Junction
		Bhangagarh Junction
		Chandmari Junction
		Ganeshguri Junction
		Maligaon Junction
		Jalukbari Junction
		Lal Ganesh Junction
		Bharalumukh Junction
		Kachari Junctions
		Khanapara Junction
		Ulubari Junction
		Six miles
		Basistha Junction
		Lokhra Junction
		9 th Mile Junction
		Goalpara to Guwahati city Junction
		Bahaita Chariali

4	Pedestrian Survey	<i>Dadara Hajo to Guwahati city Junction</i>
		<i>Majirgaon to Guwahati city Junction</i>
		<i>Narangi Junction</i>
		<i>Mandkata Junction</i>
		<i>Paltanbazaar</i>
		<i>Fancybazaar</i>
		<i>Ganeshguri</i>
		<i>Maligaon</i>
		<i>Manipur basti</i>
		<i>Rehabari road</i>
		<i>ML Nehru road</i>
		<i>Silphukuri</i>
		<i>RG Barau road</i>
		<i>Bharalumukh</i>
5	Parking Survey	<i>Paltan bazaar</i>
		<i>Chandmari Road</i>
		<i>Ulubari</i>
		<i>Christ ianbast i</i>
		<i>ML Nehru Road</i>
		<i>Mother Theresa Rd</i>
		<i>Jalukbari</i>
		<i>Adabari</i>
		<i>Maligaon</i>
		<i>Athgaon</i>
		<i>RG Barau Road</i>
		<i>Siphukuri</i>
		<i>Manipurbasti</i>
		<i>Rehabari Road</i>

(Source: Compiled by Consultants)

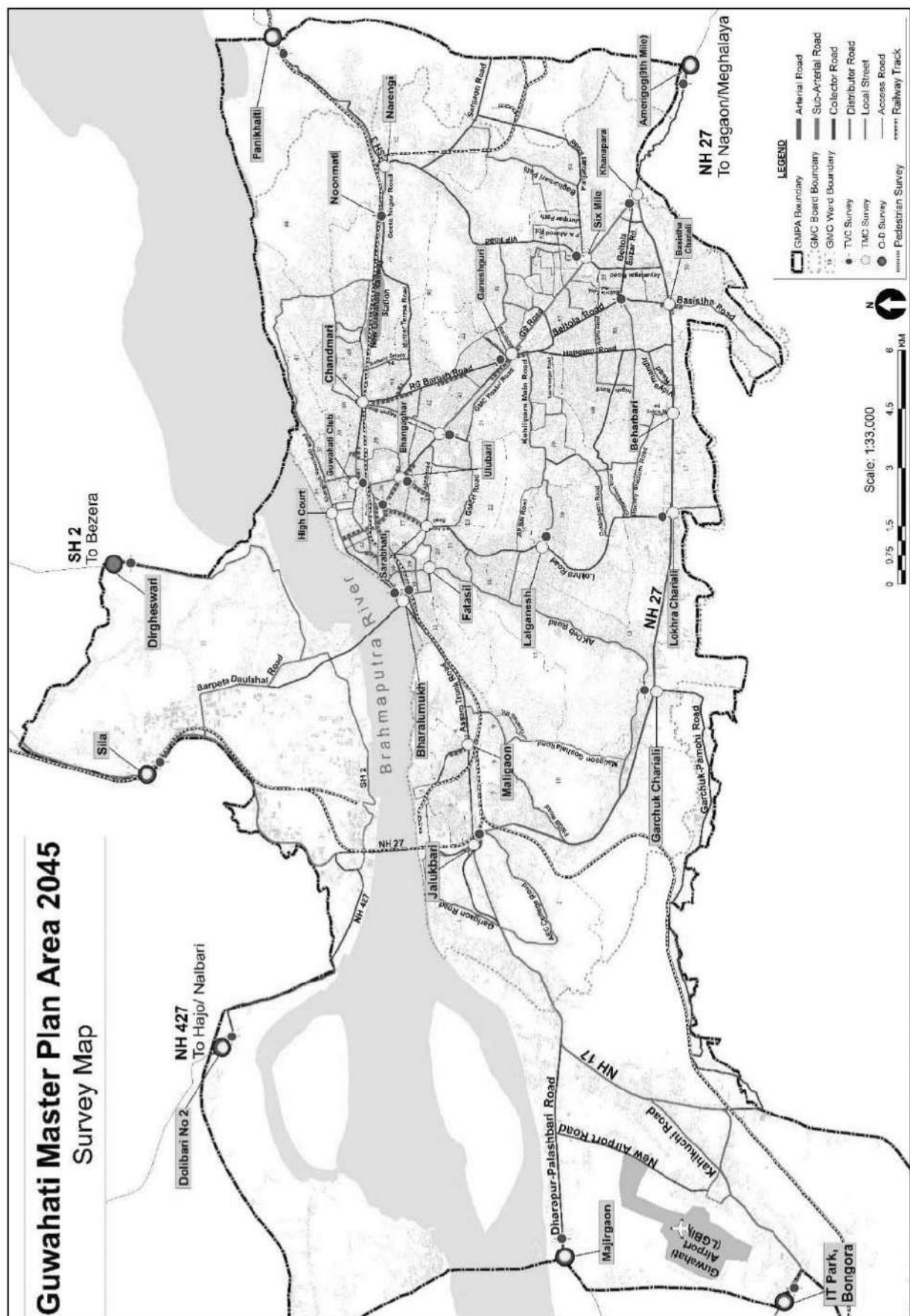


Figure 5-27 Survey map of Guwahati Planning Area

5.11.2 Major Roads

The various vehicle types having different sizes and characteristics were converted into equivalent passenger car units. The selected survey stretches comprise both urban and rural areas. Hence PCU values were adopted from IRC 64-1990 for rural areas and IRC-106-1990 for urban areas.

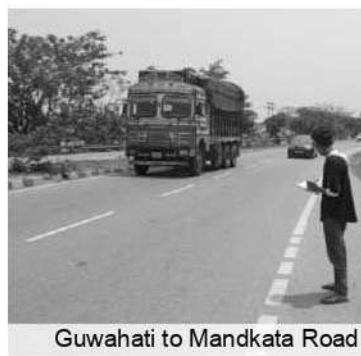
There are 22 roads taken for analysis around the Guwahati city as urban roads for traffic analysis. The photographs of survey locations are as shown in Figures below.



9th Mile Road



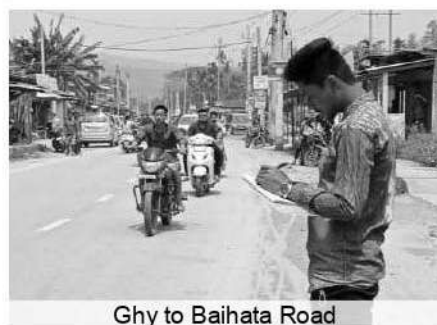
Guwahati to Goalpara Road



Guwahati to Mandkata Road



Majirgaon Road



Ghy to Baihata Road



Survey at Narangi Road



Survey at Sarabhati Road



Survey at Kahilipara Road



Survey at Jalukbari Road



Survey at Guwahati Club Road



Survey at Bhangagarh Road



Survey at Ulubari Road



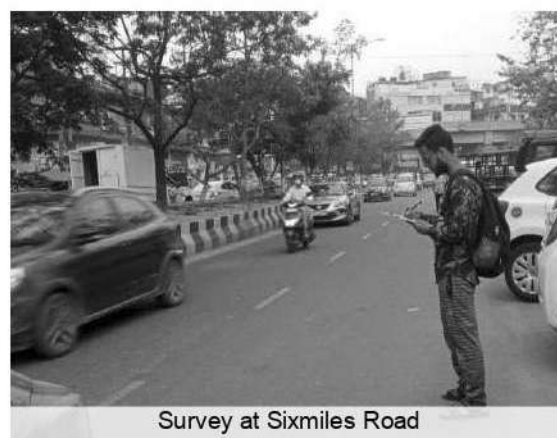
Survey at Kachari Road



Survey at Khanapara Road



Survey at Bharalumukh Road



Survey at Sixmiles Road



Survey at Ganeshguri Road



Survey at Maligaon Road

From the Classified Volume Count Survey of Guwahati, 15 roads are shortlisted for internal roads as it serves the purpose of major road in the main city, passing throughout the major region of Guwahati city. The rest & roads are considered as outer roads as they connect the Guwahati city with nearby cities and villages. Major traffic of floating population passes through these external roads.

5.11.2.1 NH-27 (Jalukbari to Khanpara)

Annual average daily traffic is **25287** PCU in this road section. Passenger vehicles like car/taxi/utility vehicles, two wheelers predominate the traffic stream. Two-wheelers and Four-wheelers were dominant in total traffic. LCVs are observed in good volume and 2 axle is very few in numbers. MAV were not much observed. ADT and AADT by vehicle type are presented in Table 5-30.

Table 5-30 Average Daily Traffic & Annual Average Daily Traffic on NH-37 (Jalukbari to Khanpara road)

Vehicle Types	ADT	AADT
Car/Jeep/Van	9245	9537
2-wheeler	10091	10173
3-wheeler	1208	1372
Minibus	837	978
Standard Bus	1111	1382
3-wheeler (Goods)	0	0
LCV	1160	1294
2 Axle	87	96
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	0	0
Cycle	68	83
Other (hand cart)	0	0
Total (Nos)	23807	24915
Total (PCU)	23728	25287

(Source: Compiled by Consultant)

5.11.2.1.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-31.

Table 5-31 Directional Distribution of Traffic on NH-37(Jalukbari to Khanpara road)

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Jalukbari to Khanpara: Khanapara to Jalukbari	Jalukbari to Khanpara: Khanapara to Jalukbari
NH-37 (Jalukbari to Khanpara)	59:41	59:41

(Source: Compiled by Consultant)

5.11.2.1.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-28. Road section is occupied by mainly two-wheeler and four-wheeler which are 39% and 48% of total traffic. Thus, commuters are using their personal vehicles to a large extent for daily routine. Public transport (bus) was observed at 5% of traffic stream. LCV and 2 axle vehicles comprised 5% of traffic.

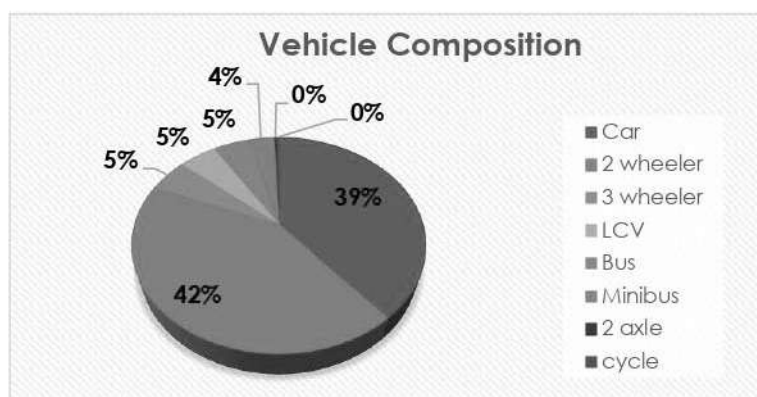


Figure 5-28 Composition of Traffic on NH-37 (Jalukbari to Khanapara) Road (Source: Compiled by Consultant)

5.11.2.1.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at NH-37 (Jalukbari to Khanapara) as shown in Figure 5-29.

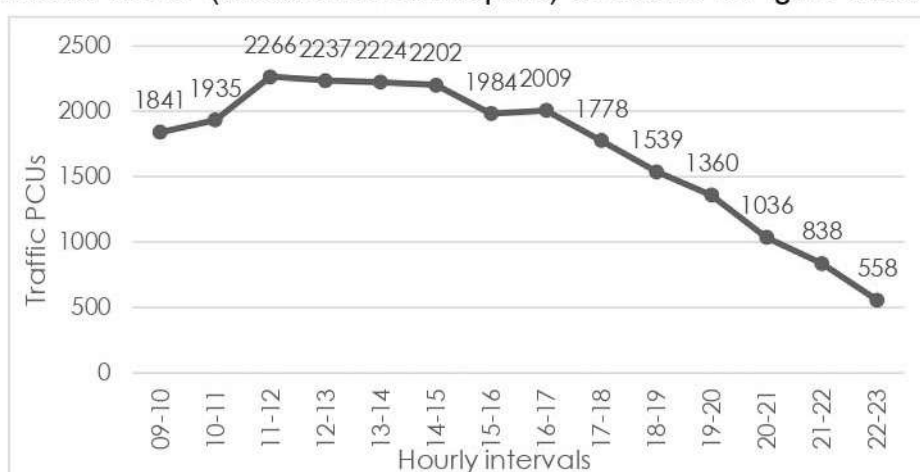


Figure 5-29 Hourly Variation of traffic at NH-37 (Jalukbari to Khanapara) Road (Source: Compiled by Consultant)

5.11.2.1.4 Peak Hour Traffic

Peak hour was found to be from 10:00 to 11:00 HRS. Total peak hour traffic is 2266 in PCU which is 9.7 % of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-32.

Table 5-32 Peak hour traffic on NH-37 (Jalukbari to Khanapara Road)

PCU/hr	Peak Hours	Peak Hour Factor
2266	10:00 to 11:00	9.7 %

5.11.2.2 Gorchuk to Fatasil Ambari Road

Annual average daily traffic is **6546** PCU in this road section. Passenger vehicles like car/taxi/utility vehicles, two wheelers predominate the traffic stream. 3-wheelers and 4-wheelers were dominant in high number. LCV are observed with good numbers while heavy goods vehicles like 3 Axle, MAV were not much observed. ADT and AADT by vehicle type are presented in Table 5-33.

Table 5-33 Average Daily Traffic & Annual Average Daily Traffic on Gorchuk to Fatasil Ambari

Vehicle Types	ADT	AADT
Car/Jeep/Van	1968	2103
2-wheeler	2761	2865
3-wheeler	882	901
Minibus	0	0
Standard Bus	16	23
3-wheeler (Goods)	0	0
LCV	682	706
2 Axle	42	63
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	0	0
Cycle	50	70
Other (hand cart)	0	0
Total (Nos)	6401	6731
Total (PCU)	6205	6546

(Source: Compiled by Consultant)

5.11.2.2.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-34.

Table 5-34 Directional Distribution of Traffic on Gorchuk to Fatasil Ambari

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Gorchuk to Fatasil Ambari: Fatasil Ambari to Gorchuk	Gorchuk to Fatasil Ambari: Fatasil Ambari to Gorchuk
Gorchuk to Fatasil Ambari	62:38	63:37

(Source: Compiled by Consultant)

5.11.2.2.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-30. Road section is occupied by mainly two-wheeler and four-wheeler vehicles which are 43% and 31% of total traffic. Thus, commuters are using their personal vehicles to a large extent for daily routine. Public transport (bus) was observed to be less at 0.1% of traffic stream. LCV and 2 axle vehicles comprised 10% of traffic.

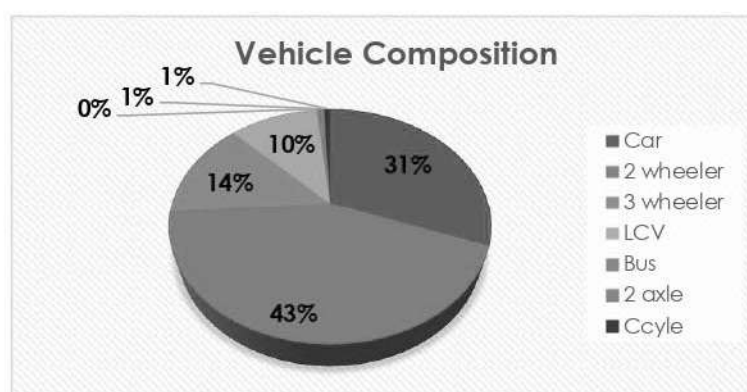


Figure 5-30 Composition of Traffic on Fatasil-Ambari Road

(Source: Compiled by Consultant)

5.11.2.2.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at Gorchuk to Fatasil Ambari as shown in Figure 5-31.

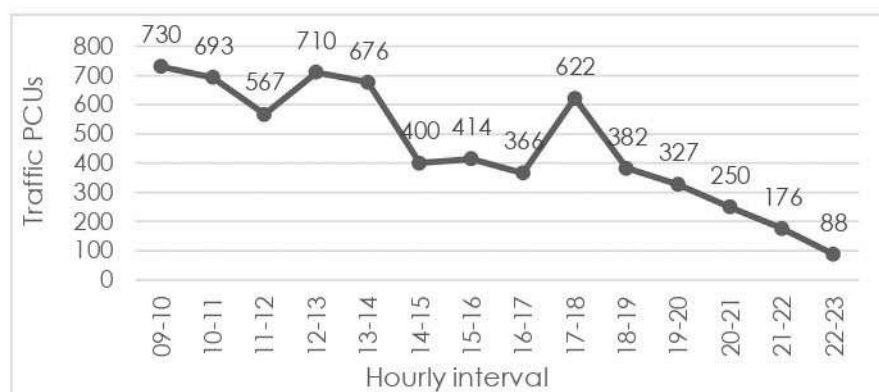


Figure 5-31 Hourly Variation of traffic at Gorchuk to Fatasil Ambari

(Source: Compiled by Consultant)

5.11.2.2.4 Peak Hour Traffic

Peak hour was found to be from 9:00 to 10:00 HRS. Total peak hour traffic is 730 in PCU which is 11.4% of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-35.

Table 5-35 Peak hour traffic on Gorchuk to Fatasil Ambari Road

PCU/hr	Peak Hours	Peak Hour Factor
730	9:00 to 10:00	11.4 %

5.11.2.3 Assam Trunk Road (Jalukbari to Bharalumukh)

Annual average daily traffic is **102139** PCU in this road section. Passenger vehicles like car/taxi/utility vehicles, two wheelers predominate the traffic stream. 2-wheeler and 4-wheeler were dominating mix traffic. Goods 3-wheeled vehicles were absent. LCVs were present in good numbers while heavy goods vehicles like 3 Axle, MAV were not observed. ADT and AADT by vehicle type are presented in Table 5-36.

Table 5-36 Average Daily Traffic & Annual Average Daily Traffic on Assam Trunk Road

Vehicle Types	ADT	AADT
Car/Jeep/Van	24135	45372
2-wheeler	28120	29648
3-wheeler	9728	10623
Minibus	0	0
Standard Bus	2540	2843
3-wheeler (Goods)	0	0
LCV	9161	10281
2 Axle	222	384
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	0	0
Cycle	435	582
Other (hand cart)	0	0
Total (Nos)	74341	99733
Total (PCU)	76018	102139

(Source: Compiled by Consultant)

5.11.2.3.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-37.

Table 5-37 Directional Distribution of Traffic on Assam Trunk Road

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Jalukbari to Bharalumukh: Bharalumukh to Jalukbari	Jalukbari to Bharalumukh: Bharalumukh to Jalukbari
Assam Trunk Road	67:33	67:33

(Source: Compiled by Consultant)

5.11.2.3.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-32. Road section is occupied by mainly two-wheeler and Four-wheeler vehicles which are 38% and 33% of total traffic. Thus, commuters are using their personal vehicles to a large extent for daily routine. Public transport (bus) was observed to be less at 3% of traffic stream. LCVs comprised 12% of traffic.

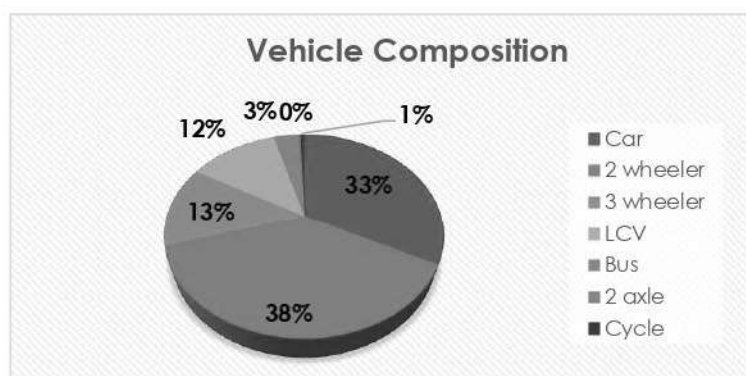


Figure 5-32 Composition of Traffic on Assam Trunk Road

(Source: Compiled by Consultant)

5.11.2.3.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at Jalukbari to Bharalumukh Road as shown in Figure 5-33.

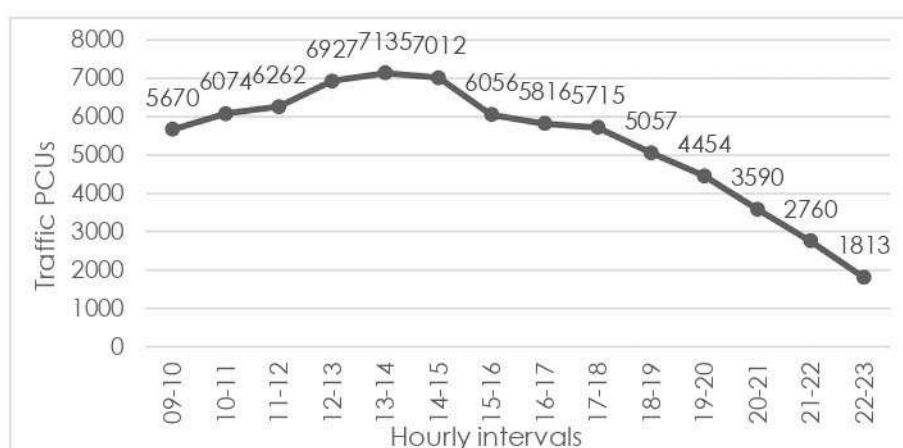


Figure 5-33 Hourly Variation of traffic at Assam Trunk Road

(Source: Compiled by Consultant)

5.11.2.3.4 Peak Hour Traffic

Peak hour was found to be from 13:00 to 14:00 HRS. Total peak hour traffic is 7135 in PCU which is 9.5 % of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-38.

Table 5-38 Peak hour traffic on Assam Trunk Road

PCU/hr	Peak Hours	Peak Hour Factor
7135	13:00 to 14:00	9.5%

5.11.2.4 Lokhra Road

Annual average daily traffic is **6901** PCU in this road section. Passenger vehicles like car/taxi/utility vehicles, two wheelers predominate the traffic stream. LCV vehicles were present in few numbers while heavy goods vehicles like 3 Axle, MAV were not much observed. 2-Axle were present in good numbers. ADT and AADT by vehicle type is presented in Table 5-39.

Table 5-39 Average Daily Traffic & Annual Average Daily Traffic on Lokhra Road

Vehicle Types	ADT	AADT
Car/Jeep/Van	3032	3172
2-wheeler	2526	2642
3-wheeler	425	561
Minibus	0	0
Standard Bus	0	0
3-wheeler (Goods)	0	0
LCV	418	501
2 Axle	22	67
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	0	0
Cycle	119	139
Other (hand cart)	32	52
Total (Nos)	6574	7134
Total (PCU)	6226	6901

(Source: Compiled by Consultant)

5.11.2.4.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-40.

Table 5-40 Directional Distribution of Traffic on Lokhra Road

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Lal Ganesh to Lokhra: Lokhra to Lal ganesh	Lal Ganesh to Lokhra: Lokhra to Lal ganesh
Lokhra Road	50:50	50:50

(Source: Compiled by Consultant)

5.11.2.4.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-34. Road section is occupied by mainly two-wheeler i.e., two and four-wheeler vehicles which are 38% and 46% of total traffic. Thus, commuters are using their personal vehicles to a large extent for daily routine. LCV and 2 axle vehicles comprised 6% of traffic.

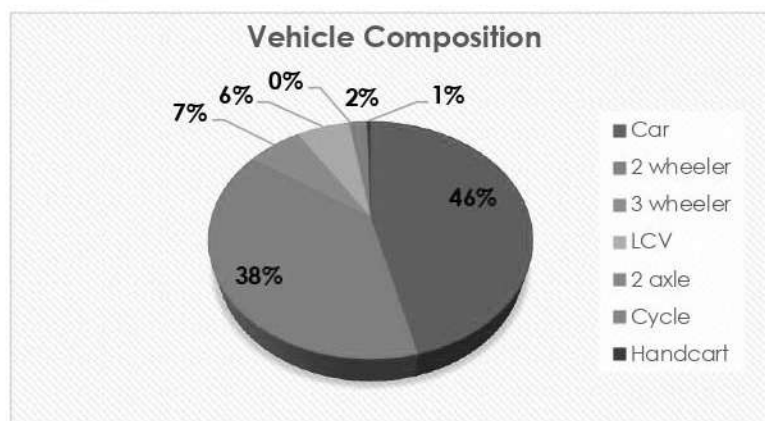


Figure 5-34 Composition of Traffic on Lokhra Road

(Source: Compiled by Consultant)

5.11.2.4.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at Lokhra to Lal Ganesh as shown in Figure 5-35.

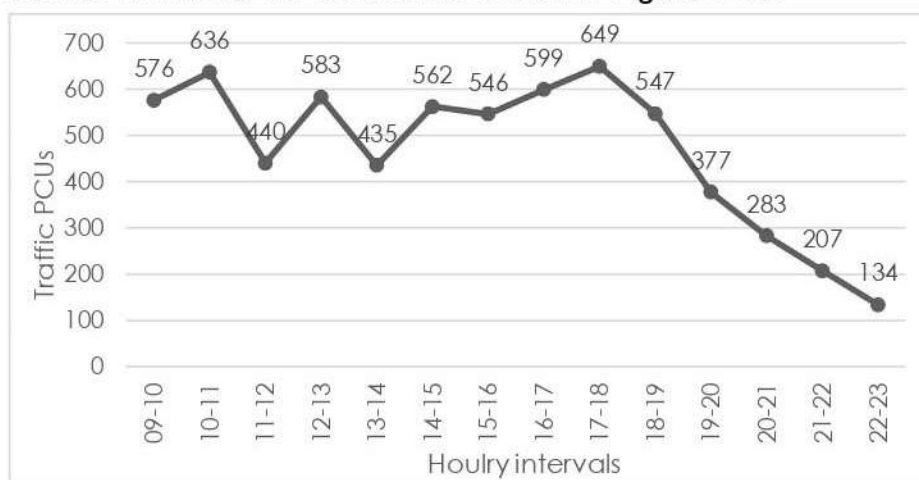


Figure 5-35 Hourly Variation of traffic at Lokhra Road

(Source: Compiled by Consultant)

5.11.2.4.4 Peak Hour Traffic

Peak hour was found to be from 17:00 to 18:00 HRS. Total peak hour traffic is 649 in PCU which is 9.8% of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-41.

Table 5-41 Peak hour traffic on Lokhra Road

PCU/hr	Peak Hours	Peak Hour Factor
649	17:00 to 18:00	9.8%

5.11.2.5 Beltola Road

Annual average daily traffic is **20942** PCU in this road section. Passenger vehicles like three-wheeler vehicles and four wheelers predominate the traffic stream. LCV vehicles were present in small number while heavy goods vehicles like 3 Axle, MAV are not observed. ADT and AADT by vehicle type is presented in Table 5-42 *Average Daily Traffic & Annual Average Daily Traffic Beltola Road*

Table 5-42 *Average Daily Traffic & Annual Average Daily Traffic Beltola Road*

Vehicle Types	ADT	AADT
Car/Jeep/Van	8519	8639
2-wheeler	9388	9427
3-wheeler	1674	1783
Minibus	284	362
Standard Bus	469	528
3-wheeler (Goods)	0	0
LCV	862	942
2 Axle	14	27
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	0	0
Cycle	70	94
Other (hand cart)	0	0
Total (Nos)	21280	21802
Total (PCU)	20271	20942

(Source: Compiled by Consultant)

5.11.2.5.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-43.

Table 5-43 *Directional Distribution of Traffic on Beltola Road*

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Basistha chariali to Ganeshguri: Ganeshguri to Basistha chairali	Basistha chariali to Ganeshguri: Ganeshguri to Basistha chairali
Beltola Road	59:41	59:41

(Source: Compiled by Consultant)

5.11.2.5.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-36. Road section is occupied by mainly two-wheeler i.e., 2 wheelers and 4 wheelers vehicles which are 44% and 40% of total traffic. 3 wheelers have 8% of share. Thus, commuters are using their personal vehicles to a large extent for daily routine. LCV and 2 axle vehicles comprised 4% of traffic.

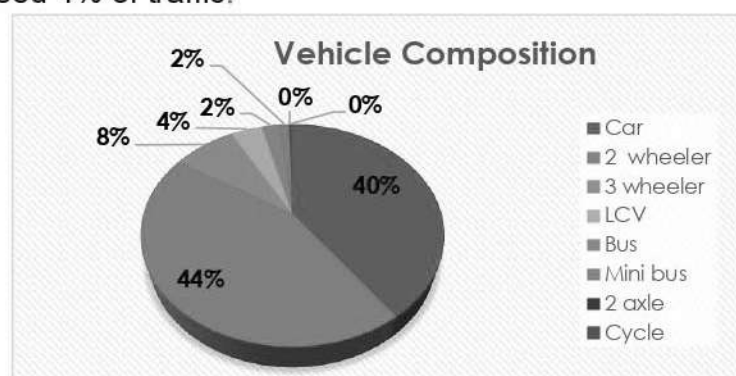


Figure 5-36 Composition of Traffic on Beltola Road

(Source: Compiled by Consultant)

5.11.2.5.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at Basistha Chariali to Ganeshguri Road as shown in Figure 5-37.



Figure 5-37 Hourly Variation of traffic at Beltola Road

(Source: Compiled by Consultant)

5.11.2.5.4 Peak Hour Traffic

Peak hour was found to be from 09:00 to 10:00 HRS. Total peak hour traffic is 2264 in PCU which is 10.6% of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-44.

Table 5-44 Peak hour traffic on Beltola Road

PCU/hr	Peak Hours	Peak Hour Factor
2264	09:00 to 10:00	10.6%

5.11.2.6 Kahilipara Road

Annual average daily traffic is **10100** PCU in this road section. Passenger vehicles like three-wheeler vehicles and two wheelers predominate the traffic stream. LCV vehicles were present in small number while heavy goods vehicles like 3 Axle, MAV were not observed. 2-Axle were observed in small numbers. ADT and AADT by vehicle type is presented in Table 5-45.

Table 5-45 Average Daily Traffic & Annual Average Daily Traffic on Kahilipara Road

Vehicle Types	ADT	AADT
Car/Jeep/Van	1744	1883
2-wheeler	5616	5723
3-wheeler	1510	1673
Minibus	0	0
Standard Bus	44	57
3-wheeler (Goods)	0	0
LCV	267	362
2 Axle	36	52
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	780	812
Cycle	281	392
Other (hand cart)	0	0
Total (Nos)	10278	10954
Total (PCU)	9394	10100

(Source: Compiled by Consultant)

5.11.2.6.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-46.

Table 5-46 Directional Distribution of Traffic on Kahilipara Road

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Lal ganesh to Kahilipara: Kahilipara to Ganeshguri	Lal ganesh to Kahilipara: Kahilipara to Ganeshguri
Lal Ganesh to Kahilipara	56:44	56:44

(Source: Compiled by Consultant)

5.11.2.6.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-38. Road section is occupied by mainly two-wheeler i.e., two-wheeler and four wheelers vehicles which are 25% and 51% of total traffic. Thus, commuters are using their personal vehicles to a large extent for daily routine. LCV and 2 axel vehicles comprised 6% of traffic.

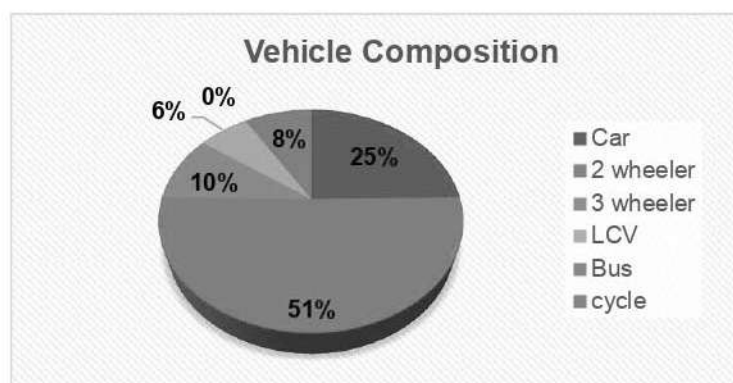


Figure 5-38 Composition of Traffic on Kahilipara Road

(Source: Compiled by Consultant)

5.11.2.6.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at Lal Ganesh to Kahilipara Road as shown in Figure 5-39.

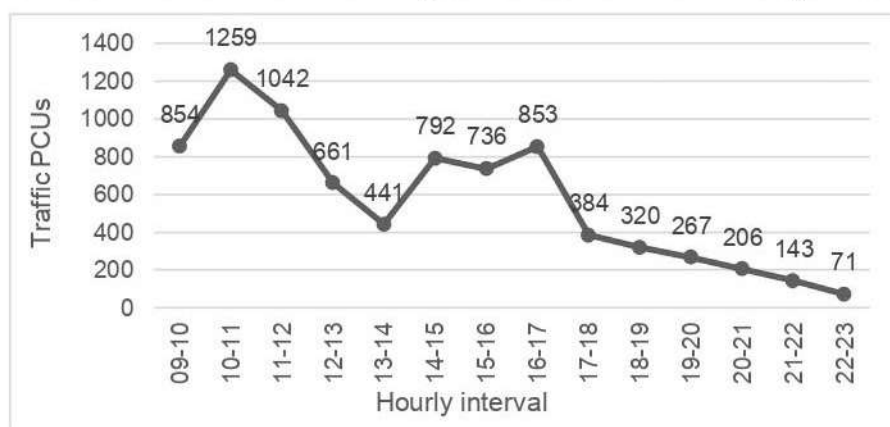


Figure 5-39 Hourly Variation of traffic at Kahilipara Road

5.11.2.6.4 Peak Hour Traffic

Peak hour was found to be from 10:00 to 11:00 HRS. Total peak hour traffic is 1259 in PCU which is 15% of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-47.

Table 5-47 Peak hour traffic on Kahilipara Road

PCU/hr	Peak Hours	Peak Hour Factor
1259	10:00 to 11:00	15%

(Source: Compiled by Consultant)

5.11.2.7 GS Road

Annual average daily traffic is 41613 PCU in this road section. Passenger vehicles like four-wheeler vehicles and two wheelers predominate the traffic stream. Non-Motorized vehicles were observed in low volume. LCV vehicles were present in good number while heavy goods vehicles like Axle, MAV were not observed. ADT and AADT by vehicle type is presented in Table 5-48.

Table 5-48 Average Daily Traffic & Annual Average Daily Traffic on GS Road

Vehicle Types	ADT	AADT
Car/Jeep/Van	16708	16935
2-wheeler	17933	18235
3-wheeler	1418	1593
Minibus	0	0
Standard Bus	1193	1275
3-wheeler (Goods)	0	0
LCV	4297	4372
2 Axle	43	58
3 Axle	0	0
MAV	0	0
Tractor	0	0
Tractor with Trailor	0	0
Cycle rikshaw	0	0
Cycle	68	73
Other (hand cart)	0	0
Total (Nos)	41660	42541
Total (PCU)	40628	41613

(Source: Compiled by Consultant)

5.11.2.7.1 Directional Split

The traffic data was analyzed to establish the directional distribution of traffic. The directional distribution of traffic at the TVC location is given in Table 5-49.

Table 5-49 Directional Distribution of Traffic on GS Road

TVC Location	Directional distribution in vehicle numbers	Directional distribution in PCU
	Ulubari to Khanapara: Khanapara to Ulubari	Ulubari to Khanapara: Khanapara to Ulubari
Ulubari to Khanapara	63:37	64:36

(Source: Compiled by Consultant)

5.11.2.7.2 Vehicle Composition

Composition of traffic at the midblock location is presented in Figure 5-40. Road section is occupied by mainly two-wheeler and four-wheeler vehicles which are 43% and 40% of total traffic. Thus, commuters are using their personal vehicles to a large extent for daily routine. LCV and 2 axle vehicles comprised 10% of traffic.

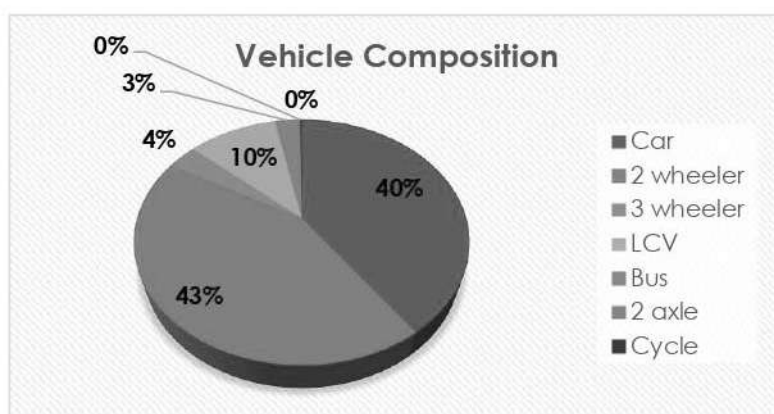


Figure 5-40 Composition of Traffic on GS Road

(Source: Compiled by Consultant)

5.11.2.7.3 Hourly Variation of Traffic

The hourly distribution of traffic to understand hourly variation and peak hour traffic characteristics at Ulubari to Khanapara Road as shown in Figure 5-41.

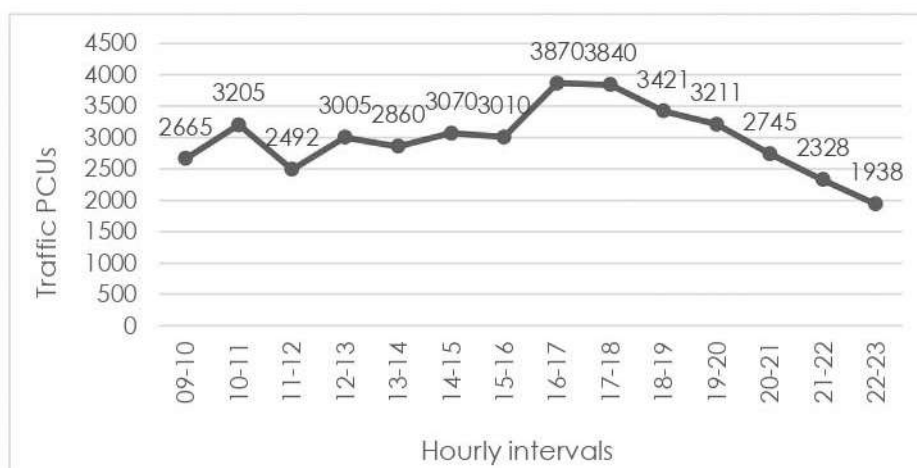


Figure 5-41 Hourly Variation of traffic at GS Road

(Source: Compiled by Consultant)

5.11.2.7.4 Peak Hour Traffic

Peak hour was found to be from 16:00 to 17:00 HRS. Total peak hour traffic is 3870 in PCU which is 9.2% of ADT. The peak hour and peak hour traffic at the midblock location is presented in Table 5-50.

Table 5-50 Peak hour traffic on GS Road

PCU/hr	Peak Hours	Peak Hour Factor
3870	16:00 to 17:00	9.2%